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OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF POLYNESIAN ETHNOLOGY AND NATURAL HISTORY

VOLUME III.

HONOLULU, HAWAII
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REPRINT OF THE

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OF THE

GENUS ACHATINELLA

WITH ADDITIONAL NOTES BY

E. W. THWING.

HONOLULU, H. I.
BISHOP MUSEUM PRESS.
1907.

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PREFACE.

THERE has been a demand on the part of collectors for original descriptions of Hawaiian land shells, many of which are now out of print. While the present paper does not claim to be complete, it is hoped that these descriptions will prove of some assistance to those who study the Genus Achatinella, and who have found difficulty in securing the original descriptions.

As Dr. C. Montague Cooke of the Museum staff is at present vigorously collecting and studying the Hawaiian Land Shells, I have, with the consent of the Trustees, asked Mr. E. W. Thwing, whose studies of these interesting shells have been very extensive to aid in the good work by ferreting out from almost forgotten places the original descriptions. The results of his careful and very considerable labor are presented in the following paper.

WM. T. BRIGHAM.

INTRODUCTION.

For a correct grouping and synonymy of the Genus Achatinella two things are exceedingly necessary: first, an exact knowledge of the geographical distribution of the shells, a knowledge only to be gained by personal collecting; and second, the ability to compare shells collected with the original types which have been described. Figures and plates without exact habitat are comparatively of little value, and are often very misleading. Few writers on this subject have been able to qualify in both of these requisites, and as a result great confusion has arisen, and many so-called new species have been added which have no right to be called such.

The present writer does not lay claim to the ability to give a correct grouping. It is simply the aim to present, as far as possible, the original descriptions, with such additional notes regarding locality, varieties, etc., as have come from the collecting and study of many thousands of these beautiful shells. The writer's own collection is one of the most extensive in the Islands, containing over 30,000 examples.

One of the greatest difficulties in giving the correct names to shells found is the fact that very few of the earlier descriptions give valley or place where the shell is found. It was only in later years when the shells were studied in their native homes that this point was found to be of first importance. Shells from one end of the mountain range, which forms the backbone of the island of Oahu, are quite different from shells found in the middle of the range or at the other end. A figure or description might not always clearly show the difference, as often exceptional forms of two widely separated groups may look similar. To one, however, who is given a hundred shells from each distinct locality the difference would be very manifest. For example, a collector with fifty *A. cestus* Newc. from Palolo (or, more exactly, the near-by valley of Wailupe) would never confuse them with fifty *A. turgida* Newc.

from the Ewa district. It is true that Dr. Newcomb's plate of *A. cestus* looks much like some forms of *A. turgida*, but with the shells before one the many real differences would be clear.

While different species may be found in the same locality, and indeed on the same tree, as a rule, with some exceptions, the same species is not found in widely separated localities. This seems to be one of the distinctive characteristics of this genus. Each species has for its home or metropolis, a valley or a succession of valleys where it may be found in abundance. As we leave this metropolis the examples found become fewer and fewer. Many species are both sinistral and dextral, others rarely so, some never both. Some species are very constant in color marking and shape, others vary greatly. During a dry season, or on exposed and dry ridges, mature shells will be smaller and less shining than under other conditions. A shell should not be described as a new species without a sufficient number of examples from a definite locality, to show the various color varieties.

In this paper there has been no definite attempt to reduce the number of species, although this is a work that should certainly be done. Some attempt, however, has been made to give a natural grouping, and with the original descriptions and a good series of the shells, each student and collector will be able to decide for himself to a large extent what shells are true species, and what names should be considered as synonyms, or simply color varieties. The descriptions are arranged as far as possible in geographical groups under each section, the shells of Oahu first being considered. It is only by a careful study of the geographical localities of the shells that the species can be correctly separated. Mr. D. D. Baldwin has given much valuable information in his discussion of the "Geographical Distribution of the Achatinella," as will be seen from the following extract from his excellent paper:—

"The facts relating to the geographical distribution of the Achatinella and the development of so large a number of species within the limits of small areas, are very remarkable and interesting, and have presented problems bearing on the theories of evolution. Each island has its own peculiar species, and not only species, but its own peculiar types, or groups of species of similar form. Again, on the islands where there has been a full development of Achatinella, each principal mountain ridge and valley has its own peculiar species which are found nowhere else; the species

of each ridge or valley being often connected with those of the next by intermediate varieties.

"Another important fact observed in the distribution of the Achatinella is, that on a mountain chain with many culminating peaks, the tendency is to a divergence of species; while on an individual mass of mountains concentrating toward a single culminating peak, the tendency is to a convergence of species.

"The structure of the Hawaiian Islands is volcanic; and in studying the distribution of shells over them it is important to note the relative ages of the several islands. Geologically speaking Kauai is the oldest; next in the series is Oahu; then Maui with the adjoining islands of Molokai and Lanai; and last comes Hawaii, in the southern portion of which volcanic fires are still raging.

"Oahu.—The development of Achatinella on this island, both as regards number and variety of form and color, has been greater than on any other island of the group. Unlike most of the other islands, which have individual mountain masses, Oahu has two true ranges or chains of mountains, a longer and a shorter one, with many independent culminating peaks. The aggregate length of the two ranges is fifty miles. The sides of these ranges the entire length are furrowed with deep valleys separating lofty ridges. These valleys and ridges are the home of the Achatinella. Each valley and ridge has its own distinct species which are connected with those of the next valley and ridge by a multitude of intermediate varieties presenting minute gradations of form and color. These two ranges of mountains have already furnished 227 distinct described species of Achatinella. The number of varieties has been estimated as high as 800 or 900. All these species and varieties are found in an area of less than 120 square miles, and a considerable portion of the longer range remains yet to be explored. These species have all the various shapes from globose conical to ovate and elongate conical, and present almost every possible shade and variety of coloring, pure white to jet black, and all the shades of green, rose, yellow, brown and ash. Sometimes several of these colors are combined in one species, either in regular or irregular bands, or tessellated, marbled or zigzaged designs.

"West Maui.—On this part of Maui we have the converse of Oahu. Its individual mass of mountains, clustering around one common centre peak, 2000 feet higher than any part of Oahu, furnishes only 30 described species of Achatinella, each principal

valley and ridge has its own peculiar species or varieties; but all the arboreal species can be referred to seven leading types, these differ much from the Oahu types, and do not present the same varieties of form or color. The prevailing colors are white and dark brown with all the intervening shades of either, plain or variously arranged in bands or zigzaged lines.

"East Maui.—The distribution of Achatinella on this part of Maui is not fully known. All its mountain gorges and ridges concentrate around the rim of the immense crater of Haleakala, a circumscribing bound of nearly thirty miles in extent. The almost impenetrable forest on the mountain slopes to the east and south of the crater, comprising a belt of twenty miles long and six miles wide, remains unexplored, and its molluscan life is unknown. The woodlands on the northwest slope of the mountain facing West Maui furnish 29 described species of Achatinella; but they are the same or unmistakable counterparts of those found on West Maui. The narrow depression of land between East and West Maui has led many to infer that they were originally separate islands; this similarity of shell types would seem to indicate that, if ever separate, they must have been united before the development of molluscan life; otherwise we should expect to find the types of East and West Maui differing as much from each other as do those of Maui and the contiguous islands of Molokai and Lanai.

"Molokai.—The distribution of Achatinella on this island presents some new features not observed on any other island. The island is forty miles long with a width of only seven miles; it is about one-third the size of Oahu, and, like it, has a mountain range extending nearly thirty miles through its length. The range is furrowed on each side by deep valleys. Some of these mountain gorges are very wide and cut deep into the narrow axis of the island. The larger ones have proved an effectual barrier to the migration of the shells. The island is thus divided into three natural sections, and each section retains its own peculiar species without intermingling with those of the next section. Molokai furnishes 25 described species which are about equally divided between the three sections of the island. These shells exhibit more variety of form and color than those of Maui, and have peculiarities which separate them entirely from types of other islands.

"Lanai.—This is the smallest and most arid of the shell-producing islands. Its area is 100 square miles, of which prob-

ably not over one-tenth is suited for the support of mollusks. The island is, however, notable as the home of A. magna, Adams, the largest shell of the whole Achatinella family. Specimens in our cabinet measure 1½ in. long. The whole number of species of Achatinella on Lanai is 13, and they exhibit peculiarities of type.

"KAUAI.—This is the oldest and most verdant island of the group. It lies to the west of Oahu and is separated from it by a channel wider than occurs between any of the other islands. Its extensive forests, luxuriant vegetation and moist climate render it peculiarly well adapted for the abode of Achatinella; and one would naturally expect to find here a larger and, if possible, higher development of the family. But we are doomed to disappointment. The island yields no arboreal species. The shells are all terrestrial, and those classed with the Achatinella belong to the plainest forms of the Amastra and Leptachatina groups; 5 species to the former and 18 to the latter group. Kauai, however, does furnish a very peculiar and interesting group of large terrestrial shells, remarkable for their elongate, turreted-form. The generic name Carelia has been provided for the group. It embraces 7 species. Specimens of Carelia turricula, Migh., in my cabinet measure 3 in. long. This group has no claims to a place in the Achatinellinæ family as classed by Mr. Gulick. It lacks the peculiar twist of the columella and other generic characters of that family. Living specimens of the Carelia are now exceedingly rare, but at some period in the history of Kauai they were very abundant. The alluvial deposits near the coasts of portions of the island contain multitudes of these shells in a semi-fossil state, which have been washed from the mountains by the freshets of ages past. The small neighboring island of Niihau also has a single species of Carelia found in sand and mud deposits. No living specimens are found there now.

"HAWAII.—This island embraces within its bounds two-thirds of the total area of the whole group. It is also supposed to be the most recently formed of the islands. The volcanic forces are still at work here. Its extensive forests are as well adapted for the support of Achatinella as those of any of the other islands. But it furnishes only a single arboreal species and 5 terrestrial. The arboreal species is A. physa. It was first described by Dr. Newcomb in Proceedings Zoological Society, London, 1853. In a subsequent number of the same journal Mr. W. H. Pease refers to

this same shell as a 'species rarely met with on the mountains of Hawaii.' Its centre of production is the Kohala range of mountains, notably the most ancient portion of the island, and it *now* exists there in unparalleled abundance. During a recent visit to the locality, in a few minutes I collected several hundred specimens, picking them from trees and low bushes as rapidly as one would gather huckleberries from a prolific field. The shell appears to be slowly migrating into the adjoining districts of Hamakua and Kona, and assuming new shapes and varieties of coloring. One of these varieties in our cabinet is almost worthy of assignment as a new species. The conchologists of a few centuries hence will no doubt be naming Achatinella from the different districts of Hawaii of manifold forms and gaudy colors, which have developed through the mysterious processes of evolution from the now humble A. physa of the Kohala mountains."

Although but a few years have passed since the above was written, this same *A. physa* has been found on Hawaii in a large variety of shades and colors, and with beautiful dark bands, showing that the changes of locality, rainfall, food and other conditions, constantly tend to change the size and color of the shells.

For study and comparison it is much better to have the shells of a collection arranged according to the localities in which they live. Thus the descriptions of the Achatinella may be arranged in the following sections, geographically:

I. Achatinella (Syn. Apex).—1. Oahu, main mountain range from S.E. to N.W. 2. Waianae Mountains.

II. Achatinellastrum. — Oahu, main mountain range from S.E. to N.W.

III. Bulimella. — Oahu, main mountain range from S.E. to N.W.

IV. Partulina.—1. Oahu. 2. Molokai. 3. Lanai. 4. East Maui. 5. West Maui. 6. Hawaii.

V. Laminella.—1. Oahu. 2. Molokai. 3. Lanai. 4. Maui.

VI. Perdicella.—1. Molokai. 2. Maui.

VII. Newcombia.—1. Molokai. 2. Maui.

VIII. Amastra.—1. Oahu. 2. Molokai. 3. Lanai. 4. Maui. 5. Hawaii. 6. Kauai.

Nearly all the shells described in this paper are represented by examples in my own collection, and many of them by a large series. Mr. D. D. Baldwin has continually furnished me with valuable assistance in the study and arrangement of this genus. Prof. W. T. Brigham and Mr. J. F. G. Stokes, of the Bernice Pauahi Bishop Museum at Honolulu, have very courteously allowed me the use of all material on the subject at their command. The large collections of Rev. O. P. Emerson and Mr. D. Thaanum have been carefully examined, as well as many other collections. Mr. C. M. Cooke Jr. has very kindly permitted me to use his careful notes on the type shells at present in the collection of the British Museum.

In some cases the descriptions have been published several times, and where the earlier work could not be secured the description is taken from a later publication, which is that indicated by the reference.

Honolulu, January, 1904.

I.

Section **ACHATINELLA** Swainson.

(Syn. APEX Von Martens.)

1. Beginning at the south-eastern end of the island of Oahu.

1. **Achatinella cestus** Newcomb.

A. cestus Newc. P. Zool. Soc. London, 1853, p. 132; pl. xxii. fig. 8.

Shell solid, ventricose, sinistral or dextral, pointed at the summit; whorls 6, rounded, corded above, last one tumid; aperture subovate; columella short, strongly tuberculate; lip slightly expanded, thickened within; colour of tip black, second and third whorls white, three last white, yellowish or black or mixed, with a white cincture traversing the sutures and cutting the body whorl below the centre, with or without a broader band below, sometimes with blotches or tessellations of black and white or longitudinal undulating lines of the same colors; columella chestnut; lip same color, interrupted with white. Long. 14/20, lat. 8/20 poll.*

A fine shell, approaching *A. similans* [*simulans*] of Reeve, which it resembles in form, but from which it differs strikingly in its markings.—Newc.

Hab. Palolo.—Newc. Niu and Wailupe.

This shell does not seem to be related to any other of this section. It is only found in the eastern valleys of Oahu.

LORATA GROUP.

2. **Achatinella lorata** Férussac.

Helix [*Cochlogena*] *lorata* Fér. Prodrome, 1822, p. 60.

Testa dextrorsa, ovato-conica, vertice acuto, nitida, striata, alba, colore epidermali; epidermide unicolore vel fasciis ornato; anfractibus 5 1-2, æqualiter crescentibus; suturis marginatis; apertura ovata, alba; columella

*One pollex equals one inch.

arcuata, eminente; rima umbilicali non distincta. (Quoy & Gaimard, Voyage.....Uranie et Physicienne.)

Shell dextral, ovately conical, apex acute, shining, striated, white, with an epidermal color; epidermis unicolored or marked with bands; whorls 5 1-2, regularly increasing; sutures margined; aperture ovate, white; columella arcuate, protruding; umbilical cleft not distinct.

Animal light flesh-colored; tentacles, tentacular sheath and front above, dark brown; outer margin of mantle gray; tentacles wide apart, short, moderately clubbed; foot rather broad and thin, when extended as long as the shell.—Newc.

A. ventrosa of Pfeiffer forms a very striking variety, with the whorls rounded, aperture contracted, and the whole shell pressed together.—Newc.

Hab. Manoa to Halawa.—Bald.

The *lorata* group is a very extensive one, covering a wide territory and including many color varieties.

3. Achatinella pallida Nuttall.

A. pallida Nutt. Jay's Catalogue of Shells.

Shell acuminately ovate, rather solid, whorls flatly convex, obliquely somewhat rudely striated, margined round the upper part, the groove being rather distinct from the sutures, columella short, broadly callous; white, more or less banded with brown or chestnut-black, lip and columella brownish-flesh. (Rve. Conch. Icon. Achat.)

Hab. Oahu.—Nutt. Panoa and Nuuanu.

This is in fact only a variety of *A. lorata* Fér.

4. Achatinella nobilis Pfeiffer.

A. nobilis Pfr. P. Zool. Soc. London, 1855, p. 202.

A. testa subimperforata, dextrorsa, turrita, solida, striatula, nitida, fulvida vel griseo-virente, saturatius strigata; spira exacte conica, apice alba, acuta; sutura leviter marginata; anfr. 6 1-2–7 planiusculis, ultimo 2-5 longitudinis subæquante, infra medium obsolete subangulato; apertura obliqua, obauriformi, intus alba; perist. expansiusculo, margine dextro intus late labiato, columellari subadnato. Long. 23, diam. 11 mill.

Shell hardly perforate, dextral, turreted, solid, somewhat striated, shining, tawny or grayish-green, strongly striped; spire markedly conical, apex white, acute; suture lightly margined; whorls 6 1-2–7, rather flat, the last nearly equal to 2-5 of the length, obsoletely angled below the periphery; aperture oblique, nearly auri-

form, white within; peristome somewhat expanded, the right margin much thickened within, subadnate to the columella.

Hab. Oahu.—Pfr. Nuuanu.

This should be classed with *A. lorata* Fér., as a long and sometimes pure white form of that shell.

5. Achatinella ventrosa Pfeiffer.

A. ventrosa Pfr. P. Zool. Soc. London, 1855, p. 6; pl. xxx, fig. 20.

A. testa imperforata, ovato-conica, solidula, striata, alba, deorsum epidermide fulva, nigro-strigata vestita; spira conica, obtusa; anfr. 5 1-2, inflatis, ultimo spira paulo breviore, basi rotundato; apertura fere diagonali, late auriformi, intus alba; plica columellari crassa, dentiformi; perist. intus labiato, margine dextro recto, substricte descendente, leviter antrorsum arcuato, columellari brevi, adnato. Long. 17 1-2, diam. 11 mill.

Shell (dextral) imperforate, ovate-conical, somewat solid, striated, white, below epidermis tawny and black striped, spire conical, obtuse; whorls 5 1-2, swollen, last a little shorter than the spire, rounded at the base; aperture nearly diagonal, broadly auriform, white within; the columellar fold thick, tool-like; lip thickened within, the right margin erect, posteriorly contracted, anteriorly lightly arcuate; columella short, adnate.

Hab. H. I.—Newc. Manoa to Halawa.

This shell may be classed with the *lorata* group, although it has a large variety of color and form.

6. Achatinella pulchella Pfeiffer.

A. pulchella Pfr. P. Zool. Soc. London, 1855, p. 6; pl. xxx, fig. 2.

A. testa imperforata, ovato-conica, sublævigata, nitida, fulva, fasciis nigro-viridibus et interdum fascia mediana alba ornata; spira conica, versus apicem acutem attenuata, alba, sutura filomarginata; anfr. 5 1-2, convexiusculis, ultimo 3-7 longitudinis subæquante, rotundato; apertura fere diagonali, subtetrogono, auriformi; plica columellari supera, dentiformi, valida; perist. intus valide labiato, margine dextro recto, strictiusculo, columellari reflexo, subadnato. Long. 15 1-2, diam. 10 mill.

Shell imperforate, ovately conical, nearly smooth, shining, fulvous, marked with greenish black bands and sometimes a white band at the periphery; spire conical, apex subacute, white; suture narrowly margined; whorls 5 1-2, slightly convex, the last almost equal to 3-7 of the length, rounded; aperture nearly diagonal, nearly tetragonal, auriform; columellar fold high, strong, dentiform; lip strongly thickened within, right margin straight, somewhat contracted, reflexed at the columella, subadnate.

Hab. Halawa to Waipio.

This may be only a blunted form of *A. lorata* Fér.

DECORA GROUP.

7. Achatinella decora Férussac.

Achatina decora Fér. Férussac & Deshayes, Hist. Nat. Moll., p. 191, pl. clv, figs. 5, 6, 7.

A. testa sinistrorsa, globoso-acuminata, solida, albida, fasciis brunneis cincta; anfractibus 5 1-2, superioribus planis, et ultimis convexis; sutura marginata; columella superne valide dentata; apertura obverse auriformi; peristomate incrassato, intus violaceo-labiato. Long. 20, lat. 14 mill.

Shell sinistral, globosely acuminate, solid, whitish, encircled with brown bands; whorls 5 1-2, the upper flat, the last convex; suture margined; columella strongly dentate above; aperture obversely auriform; lip thickened, violet-margined within.

Animal longer than the shell; of a light gamboge yellow, with slate-colored tentacles and tentacular sheath, posteriorly and superiorly slightly sprinkled with slate; mantle of a bluish yellow. —Newc.

Hab. Nuuanu and Kalihi.

The type shells contained one *A. decora* and one *A. perversa* Swain., two distinct species, which fact has caused much confusion in placing these shells.

8. Achatinella vittata Reeve.

A. vittata Rve. Rve. Conch. Icon. Achat. London, 1850; sp. 9.

Shell dextral, globosely conical, rather ventricose, whorls rather broadly marginated round the upper part, columella callous, scarcely toothed, lip rather thickened; white, encircled with lines and fillets of pale brown, black at the apex.

This species is met with in Nuuanu Valley, some three miles from Honolulu. The inflated variety designated as *A. globosa* by Dr. Pfeiffer, is not uncommon. The typical specimen of this species in the Cumingian collection is more elongated than is common, but is entirely satisfactory in establishing in my mind the claims of this species.—Newc.

A dextral form of *A. decora* Fér.—Bald.

Hab. Pauoa Ridge.

9. Achatinella simulans Reeve.

A. simulans Rve. Rve. Conch. Icon. Achat. London, 1850; sp. 15.

Shell globosely conical, sinistral, sharp towards the apex, whorls conspicuously margined at the sutures, columella short, flatly callous; white, encircled with a very few light brown lines,

with an intense brown band around the columella, lip and columella tinged with light purple.

Hab. Bottom of Nuuanu Valley.

This species in coloring is so like *A. decora* that Mr. Reeve gave it the name of the "Allied Achatinella." He said, however, that the spire is more acuminate, and the last whorl not so broad and ventricose. I think without doubt it is the same as *A. decora*.

10. Achatinella albofasciata Smith.

Apex albofasciatus Sm. P. Zool. Soc. London, 1873, p. 78; pl. ix., fig. 21.

Testa sinistrorsa (interdum dextrorsa), perforata, globoso-conica, incrementi lineis leviter striata, badia, saturatius strigata; anfract. ultimus zonis albis 2–3 (media semper lata) cinctus; apex albus; anfract. 6, primi 4 planiusculi, cæteri convexi; sutura albo distincte marginata; apertura intus rubescens; perist. leviter dilatatum, intus incrassatum, rubescens, medio fascia alba externa notatum; plica columellaris valida, rosacea, ejus apice alba. Long. 19, diam. 12 1-2 mill.

Shell sinistral (sometimes dextral), perforate, globosely conical, finely striated with lines of growth, reddish brown, more darkly striped; the last whorl encircled with 2–3 white bands (the median always broad); apex white; whorls 6, first 4 rather flat, the others convex; suture distinctly margined with white; aperture reddish within; peristome slightly expanded, thickened within, reddish, marked in the middle by the external white band; columellar fold strong, rosy, the apex of which is white.

This species, of which there are several specimens in the British Museum collection, some sinistral and others dextral, I am unable to locate with any yet described.—Sm.

Hab. H. I.—Sm. Nuuanu.

This seems to be the light brown and white variety of *A. decora* Fér. found on the Kalihi side of Nuuanu Valley.

11. Achatinella globosa Pfeiffer.

A. globosa Pfr. P. Zool. Soc. London, 1855, p. 7; pl. xxx, fig. 25.

A. testa subimperforata, dextrorsa, conico-globosa, tenuiuscula, striatula, alba, lineis fuscis cingulata; spira brevi, convexiusculo-conica, subacuta; sutura levi, submarginata; anfr. 5, modice convexis, ultimo ventroso, spiram subæquante, basi fusco; apertura obliqua, subtetragono-ovali, intus margaritacea; plica columellari levi, vix torta; perist. acuto, fusco-limbato, intus albo-sublabiato, margine columellari incrassato, subadnato. Long. 17, diam. 11 1-2 mill.

Shell dextral, nearly imperforate, conically globose, rather thin, somewhat striated, white, encircled with brown lines; spire

short, slightly convexly conic, subacute; suture lightly impressed, submarginate; whorls 5, moderately convex, the last ventricose nearly as long as the spire; brown at the base; aperture oblique, subquadrangularly oval, pearly within; columellar fold inconspicuous, hardly twisted; lip acute, brown-margined, inner edge of lip white, margin thickened at the columella, subadnate.

Hab. H. I.—Frick. Nuuanu.

Its appearance is very similar to *A. decora* Fér., and if found in Nuuanu Valley is undoubtedly that shell. Mr. Baldwin places it as an inflated variety.

TURGIDA GROUP.

12. **Achatinella turgida** Newcomb.

A. turgida Newc. P. Zool. Soc. London, 1853, p. 134; pl. xxii, figs. 10, 10*a*.

Shell ventricose, pointed at the apex, sinistral or dextral, smooth, polished, gradually enlarging for four turns and then very rapidly, the last two forming most of the shell; suture slightly impressed, beneath which revolves a linear depression; aperture subovate; columella short, terminating in a strong conical tubercle projecting into the aperture; outer lip simple, thickened within, slightly tinged with pink or brown; tubercle the same; fauces white; coloring extremely various, ground white, yellow or black, with (or without) longitudinal zigzag lines, transverse bands or blotches covering the surface. Long. 14/20, lat. 11/20 poll.

Hab. Ewa.—Newc. The metropolis of this shell is Waipio.

This and the following three shells may be placed together as the *turgida* group.

13. **Achatinella polymorpha** Gulick.

Apex polymorpha Gk. P. Zool. Soc. London, 1873, p. 81; pl. x, fig. 5.

Testa dextrorsa, subperforata, globoso-conica, nitida, incrementi lineis (haud spiralibus) striata, dilute brunnea, zonis pluribus strigisque cyaneo-nigris ornata, zona lata nivea ad peripheriam cincta; sutura leviter marginata, brunnea; anfract. 6, primi 4 convexiusculi albidi, cæteri convexi; spira leviter concava; apertura alba; perist. margine brunneo tinctum, intus incrassatum; plica columellaris valida, albida. Long. 17, diam. 12 mill.

Var. A. Testa cervina, sutura brunnea.

Var. B. Testa alba, zonis paucis basique brunneis ornata; sutura brunnea.

Shell dextral, subperforate, globosely conical, shining, striated with lines of growth (not spiral), light brown, marked with many bands and bluish black stripes, encircled with a broad snow-white band at the periphery; suture slightly margined, brown;

whorls 6, first 4 somewhat convex, whitish, the rest convex; spire slightly concave; aperture white; lip tinged with brown at the margin, thickened within; columellar fold strong, whitish.

Hab. The typical forms are found in Waipio and Wahiawa on Oahu. Varieties are sometimes found in Kalaikoa and Ahonui.—Gk.

Mr. Gulick says: It is most nearly allied to *A. versicolor* Gk., and *A. tuberans* Gk.

14. Achatinella cookei Baldwin.

A. cookei Bald. P. Acad. Phil., 1895, p. 220; pl. x, fig. 15.

Shell dextral, subperforate, solid, globose, with spire regularly conical, apex subacute; surface shining, marked with fine incremental lines; the apical whorls smooth. Color, basal portion below the periphery jet black or sometimes brownish black, the apex white, rest of the shell very light brown, darker on the sutural margin. Whorls 6, margined above, the first three plain, the rest convex, the last inflated; suture well impressed. Aperture very oblique, oval, white within; peristome obtuse, slightly thickened within, narrowly reflexed, the columellar margin forming an obtuse, sinuous ridge, with the small umbilical cleft almost covered by it; extremities united by a thin callus; color purplish brown on both face and the reflexed portion; columella terminating in a strong flexuous tubercle, tinged with purplish brown. Length 21, diam. 15 mm.

Animal: Mantle dark slate with a narrow brown band encircling the outer edge. Superior portion of foot light brown, mottled with slate, under surface dingy white.

This species is rare and very local in its distribution. It has affinities with *A. turgida* Newc., which is found in the same district, but differs somewhat in form and in the peristome. We are unacquainted with the animal of *A. turgida*. If it proves identical with that of *A. cookei*, the latter must rank as a variety of the former.—Bald.

Hab. Waiau, Ewa.—Bald.

Somewhat related to *A. turgida* Newc.

15. Achatinella ovum Pfeiffer.

A. (*Achatinellastrum*) *ovum* Pfr. P. Zool. Soc. London, 1856, p. 334.

A. testa sinistrorsa, imperforata, globoso-conica, solida, uguloso-striata, nitidula, albida; spira concaviusculo-conica, apice acuta; sutura profunde marginata; anfr. 5 1-2, superis planis, sequentibus convexis, ultimo inflato,

spira vix breviore; plica columellari crassa, tuberculiformi, pallide lilacea; apertura diagonali, sinuato-semicirculari; perist. recto, nigro-fusco, limbato, intus crenato-labiato. Long. 19 1-2, diam. 13 mill.

Shell sinistral, imperforate, globosely conical, solid, roughly striate, rather shiny, whitish; spire concavely conical, apex acute; suture deeply margined; whorls 5 1-2, the upper plain, the following convex, the last inflated, hardly shorter than the spire; columellar fold thick, tuberculiform, pale lilac; aperture diagonal, sinuously semicircular; lip erect, blackish brown, margined, crenulately thickened within.

Hab. Oahu.—Newc. Nuuanu.

FORBESIANA GROUP.

16. Achatinella forbesiana Pfeiffer.

A. forbesiana Pfr. P. Zool. Soc. London, 1855, p. 5; pl. xxx, fig 16.

A. testa subperforata, dextrorsa vel sinistrorsa, ovato-conica, solida, conferte striatula, nitida, grisea vel albida, fasciis crebris griseis vel fuscis, sæpe confluentibus picta; spira exacte conica, sursum alba, apiculo nigro acutiusculo; sutura marginata; anfr. 6, convexiusculis, ultimo spira paulo breviore, rotundato; apertura obliqua, obauriformi; plica columellari supera, valida, nodiformi; perist. fusculo vel carneo limbato, margine externo breviter expanso, columellari crasso, subadnato. Long. 19, diam. 10 1-2 mill.

Shell subperforate, dextral or sinistral, ovately conical, solid, closely striated, shining, gray or whitish, marked with numerous gray or brown bands, often confluent; spire markedly conical, white above, with a somewhat acute black-tipped apex; suture margined; whorls 6, somewhat convex, the last a little shorter than the spire, rounded; aperture oblique, obauriform; columellar fold high, strong, tuberculiform; lip margined with brownish or flesh color, with the external edge slightly expanded, thickened at the columella, subadnate.

Hab. Waialua, Oahu.—Bald. Near Waipio.

17. Achatinella coniformis Gulick.

Apex coniformis Gk. P. Zool. Soc. London, 1873, p. 80; pl. ix, fig. 23.

Testa sinistrorsa (interdum dextrorsa), globoso-conica, nitida, incrementi lineis oblique (haud spiralibus) striata, brunnea, dilute brunneo strigata, lineis spiralibus pluribus albidis indistincte cincta; sutura saturate brunneo marginata; spira leviter concava; anfract. 6 1-2, primi 3 1-2 convexiusculi, albidi, cæteri convexi; apertura recedens, alba; perist. paululum dilatatum intusque incrassatum, margine dilute roseo (vel brunneo) tinctum; plica columellaris valida. Long. 18, diam. 12 mill.

Var. Testa sinistrorsa, cinereo-fusca, albo strigata, et lineis paucis spiralibus albis cincta; sutura brunnea.

Shell sinistral (sometimes dextral), globosely conical, shining, striated obliquely with lines of growth (not spiral), brown, striped with light brown, indistinctly encircled with many whitish spiral lines; suture richly margined with brown; spire slightly concave; whorls 6 1-2, first 3 1-2 somewhat convex, whitish, others convex; aperture receding, white; perist. slightly dilated and thickened within, with the margin tinged with pale rose (or brown); columellar fold strong.

Hab. Kalaikóa and Ahonui; rare in Wahiawa and Helemano.—Gk.

18. Achatinella neglecta Smith.

Apex neglectus Sm. P. Zool. Soc. London, 1873, p. 78; pl. ix, fig. 22.

Testa vel sinistrorsa vel dextrorsa, imperforata, globoso-conica, incrementi lineis leviter striata, dilute brunnea, saturatius vel cinereo strigata; regio umbilicalis sæpe castanea; apex albus; spira concaviuscula; anfract. 6, primi 4 planiusculi, cæteri convexi; sutura saturate castaneo distincte marginata; apertura intus albida; perist. fuscescens, intus incrassatum; plica columellaris valida, rubescens. Long. 17, diam. 11 1-2 mill.

Shell sinistral or dextral, imperforate, globosely conical, finely striated with lines of growth, pale brown striped with deeper brown or gray; often chestnut near the umbilicus; apex white; spire somewhat concave; whorls 6, first 4 more or less flat, the others convex; suture distinctly margined with deep chestnut; aperture whitish within; lip brownish, thickened within; columellar fold strong, reddish.

In form this species agrees very fairly with some varieties of *lugubris* Chem.; but it has shorter spire and blunter apex than the usual form of that species. The coloration is of a different character.—Sm.

Hab. Wahiawa.

Dr. Cooke found that, in the type examples, the dark suture and the characteristic bands would seem to place this shell in the *forbesiana* group.

19. Achatinella flavida Gulick.

Apex flavidus Gk. P. Zool. Soc. London, 1873, p. 80; pl. x, fig. 1, 1*a*.

Testa dextrorsa (interdum sinistrorsa) breviter ovato-conica, parum nitida, incrementi lineis (haud spiralibus) striata, plusve minusve flavida, anfract. medio zona lata fusca (basi interdum zonis 2–3) cincta; sutura anguste fusco (interdum albo) marginata; anfract. 6, convexiusculi, primi 3 semper albi; spira fere recte conica, vix concava; apertura albida, recedens; perist. pallide roseum, aliquanto dilatatum, intus incrassatum; plica columellaris magna, rosea. Long. 20, diam. 12 1-2 mill.

Var. A. Testa dextrorsa vel sinistrorsa, subgloboso-conica, flava, zonis 2–6 fuscis aut cinereo-fuscis cincta.

Var. B. Testa omnino flava.

Shell dextral (sometimes sinistral), short ovate-conic, hardly shining, striated with lines of growth (not spiral), more or less bright yellow, the whorls encircled in the middle with a broad brown band (sometimes 2–3 bands at the base); suture narrowly margined with brown (sometimes with white); whorls 6, slightly convex, the first 3 always white; spire almost perfectly conical, hardly concave; aperture whitish, receding; lip light rose, somewhat expanded, thickened within; columellar fold large, rose.

Affinities. It is most nearly allied to *A. tuberans* Gk.

Remarks. In Kalaikoa all are dextral; in Ahonui one-tenth are sinistral.—Gk.

Hab. The metropolis is in Kalaikoa, on Oahu; it is also found in Ahonui.—Gk.

Named from its yellow color.

20. Achatinella tuberans Gulick.

Apex tuberans Gk. P. Zool. Soc. London, 1873, p. 81; pl. x, fig. 3.

Testa dextrorsa, globoso-conica, nitida, incrementi lineis (haud spiralibus) striata, cinereo strigata, zonis pluribus albidis nigro-fuscisque interrupta; sutura marginata, pallida; anfract. 6, primi 3 albidi, convexiusculi, cæteri convexi; spira concava; apertura alba; perist. aliquanto dilatatum, intus incrassatum, dilute roseo-fusco tinctum; plica columellaris valida, albida. Long. 20, diam. 13 1-2 mill.

Var. A. Testa alba, fusco luteoque varie zonata.

Var. B. Testa subflava, nigro-fusco crebre zonata.

Shell dextral, globosely conical, shining, striated with lines of growth (not spiral), striped with ash, separated into many whitish and blackish brown bands; suture margined, whitish; whorls 6, first 3 whitish, somewhat convex, the others convex; spire concave; aperture white; lip somewhat expanded, thickened within, tinged with light rose brown; columellar fold strong, whitish.

This is a dextral species. Sinistral forms are found only in a few specimens passing into other species.—Gk.

Affinities. It is most nearly allied to *A. flavidus* Gk.

Hab. The metropolis of this species is Kalaikoa, on Oahu. It is also found in Ahonui; and single specimens have been brought from Wahiawa and Helemano.—Gk.

21. Achatinella leucorrhaphe Gulick.

Apex leucorrhaphe Gk. P. Zool. Soc. London, 1873, p. 79; pl. x, fig. 2.

Testa dextrorsa, breviter ovato-conica, incrementi lineis (haud spiralibus) striata, grisea, strigis saturate cinereis irregulariter interruptis, lineisque spiralibus paucis albis indistinctis ornata; sutura late niveo marginata;

anfract. 6 1-2, apex nigrescens, primi 4 albi, subplani, cæteri convexi; apertura parva, subauriformis, alba; perist. leviter dilatatum intusque incrassatum; plica columellaris magna, rosea. Long. 19, diam. 12 mill.

Var. Testa ovato-conica, griseo saturate cinereoque regulariter strigata; spira recte conica.

Shell dextral, short ovate-conic, striated with lines of growth (not spiral), gray, irregularly broken by dark ash stripes, and marked with a few indistinct white spiral lines; suture broadly margined with snow white; whorls 6 1-2, apex blackish, first 4 white, nearly flat, the others convex; aperture small, subauriform, white; lip slightly expanded and thickened within; columellar fold large, rose.

No sinistral form of this species has been found.—Gk.

Hab. Kalaikoa. A variety with spire regularly conical is reported to have been found in Waimea.—Gk.

22. Achatinella versicolor Gulick.

Apex versicolor Gk. P. Zool. Soc. London, 1873, p. 80; pl. ix, fig. 18.

Testa sinistrorsa, globoso-conica, nitida, incrementi lineis (haud spiralibus) striata, griseo-alba, nigro-fusco irregulariter strigata et zonata, basi nigro-fusca; sutura leviter marginata, alba (interdum brunnea); spira leviter concava; anfract. 6, primi 3 pallidi, convexiusculi, cæteri convexi; apertura alba, recedens; perist. aliquanto dilatatum, intus limbatum dilute roseo-fusco tinctum; plica columellaris valida, palide rosea. Long. 19, diam. 13 mill.

Var. Testa griseo-alba vix strigata; anfract. ult. ad peripheriam basimque nigro-fusco zonatus.

Shell sinistral, globosely conical, shining, striated with lines of growth (not spiral), grayish white, irregularly striped and banded with blackish brown, blackish brown at the base; suture lightly margined, white (sometimes brown); spire slightly concave; whorls 6, first 3 light, somewhat convex, the others convex; aperture white, receding; lip somewhat expanded, tinged within the margin with light rose brown; columellar fold strong, pale rose.

Affinities. It seems to be an intermediate form between *A. decorus* Fér. and *A. tuberans* Gk. This species is always sinistral.—Gk.

Hab. Ahonui and Kalaikoa, on Oahu.—Gk. Wahiawa.

23. Achatinella innotabilis Smith.

Apex innotabilis Sm. P. Zool. Soc. London, 1873, p. 78; pl. ix, fig. 17.

Testa sinistrorsa, subperforata, globoso-conica, incrementi lineis leviter striata, cervina, saturatius strigata (interdum lineis spiralibus paucis albis fuscisque ornata); apex fere albus, nucleo rubro-corneo; anfract. 6, primi 4 planiusculi, cæteri convexi; sutura distincte marginata; apertura intus pallide rubescens; perist. leviter dilatatum, intus incrassatum; plica columellaris magna. Long. 18 1-2, diam. 11 1-2 mill.

Shell sinistral, subperforate, globosely conical, finely striated with lines of growth, dun, darker striped (sometimes marked with a few spiral white and brown lines); apex almost white, nucleus reddish horn; whorls 6, first 4 somewhat plain, the others convex; suture distinctly margined; aperture pale reddish within; lip slightly expanded, thickened within; columellar fold large.

Of a uniform fawn color, with darker stripes of the same hue, the apex being paler (almost white) and the nuclear whorl reddish horn-colored.—Sm.

Hab. H. I.—Sm. Kalaikoa.

Dr. Cooke found the type to be a small *decora*-like shell with a ground color of light chocolate, or white or light yellow brown, and with very narrow white or brown bands on the last whorl; color of suture slightly darker.

24. Achatinella albospira Smith.

Apex albospira Sm. P. Zool. Soc. London, 1873, p. 77; pl. x, fig. 8.

Testa dextrorsa, subperforata, breviter ovato-conica, parum nitida, incrementi lineis (haud spiralibus) striata, alba, zona peripheriam supra et basi livido-brunnea; sutura leviter marginata; anfract. 6, primi 4 convexiusculi, cæteri convexi; apertura alba; perist. intus incrassatum; plica columellaris valida, alba, reflexa, rimam parvam fere tegens. Long. 17, diam. 10 mill.

Var. Testa alba, zonis paucis flavis peripheriam supra ornata basimque versus flava zonis paucis saturatioribus cincta.

Shell dextral, subperforate, short ovate-conic, shiny, striated with lines of growth (not spiral), white, a livid brown band above the periphery and on the base; suture finely margined; whorls 6, first 4 somewhat convex, the others convex; aperture white; lip thickened within; columellar fold strong, white, reflexed, almost concealing the small umbilicus.

Hab. Reported to be from Ewa.—Sm.

This shell seems very nearly allied to *A. turbiniformis* Sm., a shell found in Lihue. The brown color is generally more marked on the last whorl, however. The shell is named from its pure white spire, which seems to stand out from the inflated body whorl. An almost pure white example has been reported from Wahiawa.

25. Achatinella tumefacta Gulick.

Apex tumefactus Gk. P. Zool. Soc. London, 1873, p. 82; pl. ix, fig. 20.

Testa perforata, sinistrorsa, globoso-conica, nitida, incrementi lineis spiralibusque indistinctis striata, alba, zonis paucis olivaceo-fuscis cincta; sutura marginata; spira vix concava; anfract. 6, primus nigrescens, primi

3–4 convexiusculi, cæteri convexi; apertura recedens, alba; perist. dilatatum, intus incrassatum; plica columellaris valida, alba. Long. 19, diam. 12 mill.

Var. A. Testa olivaceo-fusco strigata, zonis 1–3 albis interrupta; sutura albo marginata.

Var. B. Testa cervina vel nigro vel fusco strigata ad peripheriam zona lata alba interrupta; sutura albo marginata.

Shell sinistral, perforated, globosely conical, shining, striated with lines of growth and indistinct spiral lines, white, encircled with a few olive-brown bands; suture margined; spire hardly concave; whorls 6, the first blackish, first 3–4 slightly convex, the others convex, aperture receding, white; lip expanded, thickened within; columellar fold strong, white.

Affinities. It is related to *A. decorus* Fér. (syn. *A. perversus* Swain.), which is found in Helemano and Kawailoa. It is distinguished by its smaller size, its concavely conical spire and its paler colour, which is differently distributed. The three upper whorls of *A. decorus* are of a yellowish tinge; in this species they are white, terminated with a black dot, which is not found in the typical forms of the other species.—Gk.

Hab. Wahiawa; rarely in Helemano.—Gk.

This species is never dextral.

LUGUBRIS GROUP.

26. Achatinella lugubris Chemnitz.

Turbo lugubris Chem. Conch. Cab., xi, 1795, p. 278; pl. ccix, figs. 2059, 2060.

Testa dextrorsa, trochiformis, polita, nitida, argute striata; anfractibus 5, primoribus conicis, attenuatis, ultimo gibbo, ventricoso; suturis apice non duplicatis, reliquis marginatis, linea distinctis adnata; colore nigro apice albido luteo; apertura intus alba, semilunata; peristomate intus incrassato; columella clausa. (Quoy et Gaimard, Voyage ..... Uranie et Physicienne, p. 479.)

Shell dextral, trochiform, polished, shining, distinctly striated; whorls 5, the upper conical, attenuated, the last gibbous, ventricose; suture not duplicate on the apex, the rest margined; color black, yellowish white at the apex; aperture white within, semilunate; peristome thickened within; imperforate.

A. lugubris was first described as *Turbo apex fulva* by Captain George Dixon in the narrative of his Voyage Round the World (London, 1789), p. 354, in which he says: "At the same islands (Hawaiian) are great plenty of beautiful shells, such as *Cypræa Tigrina*, *Mauritiana*, *Talpa*, and others of that genus; and numberless species of the smaller kinds, of which last the natives form

necklaces, bracelets, and other ornaments: one of these necklaces afforded a singular species of the *Helix* genus of Linnæus, which I am informed is a fresh water shell. It is outwardly smooth, has seven spires, and is of a black-brown colour, except the tip, which is pale yellow: the inside is smooth and white, and the mouth is marginated within. It is remarkable for a knob or tooth on the columella, but which does not wind round it, consequently excludes it from the *Voluta* genus of Linnæus, to which at first sight it appears to be related. As I presume it to be a species hitherto undescribed, I have taken the liberty to give it the trivial name of *Apex Fulva*, or the Yellow Tip. A figure of it, in two views, is given in one of the following plates."

Hab. H. I.—Dixon. Kawailoa.—Bald. Waialua.

This shell, the first of the Achatinellidæ ever described, is very rare now, if not extinct. Some dark forms of *A. swiftii* Newc. approach near to it, but yet seem to be distinct. The shells grouped with this are also sometimes classed as the *swiftii* group, but the older name is better.

27. Achatinella pica Swainson.

A. pica Swain. Zool. Ill., iii, p. 99, fig. 1, 1832.

A. testa trochiformi, nigrâ; apice columellæque basi albis.

Shell trochiform, black; apex and base of the pillar white. Shell 7-10 of an inch long, body whorl convex, spire conic; the three upper whorls white or fulvous, without any convexity, and forming a conic point. Suture thickened, and margined by a sulcated groove. Interior of the aperture and base of the pillar white; the latter tinged with rose color; margin of the outer lip within, bordered with black.

Mr. Swainson, in the Quart. Journ. of Sci., Lit. and Art, vol. xxv, Jan. to June, 1828, gave the following interesting notes on the shells: "The shells forming the present group are all of a small size; the largest not equalling an inch in length. In general they resemble *Bulimi*, both as regards form, and the proportionate length of the spire, the principal whorl being more or less ventricose; but in some it is sufficiently short to render the shell trochiform. This circumstance, joined to the thickened and somewhat projecting base of the columella, induces me to believe, that the proposed type of the genus has been mistaken by Lamarck for

a marine shell, and described, in his *Systeme*, under the name of *monadonta seminigra*. This supposition cannot, however, be verified, unless by a reference to the specimen he described. It is also rendered somewhat doubtful, as he does not quote the figures, in Dixon's Voyage Round the World, which (although I have not the book this moment before me) accurately represent my *A. pica*. In this, as well as in all the other species, the thick and abruptly truncated base of the pillar gives it the appearance of an obtuse tooth, covered with a white enamel. The extreme margin of the outer lip is acute, but it is internally bordered by a thickened rim. These characters, in all the species I have yet seen, are strongly developed, and render this group one of the most conspicuous in the family of *Helicina*."

Hab. Islands of the Pacific Ocean. Waialua, foot of Kawailoa gulch.

This is without doubt the same shell as *A. lugubris* Chem.

SWIFTII GROUP.

28. Achatinella swiftii Newcomb.

A. swiftii Newc. P. Zool. Soc. London, 1853, p. 133; pl. xxii, fig. 9, 9*a*.

Shell ventricose, pointed at the apex, smooth, polished, shining; whorls 6, slightly rounded above, the last strongly inflated, distinctly margined above; lip purplish rose, thick and slightly subreflected; aperture ovate; columella short, terminating in a tubercle of the color of the lip; three first whorls white, the lower with very fine and numerous markings of black and white arranged longitudinally to the shell, giving it a grayish aspect: fine obsolete white lines traverse the shell transversely, and a white sutural line is traced on the last two whorls. Long. 14/20, lat. 10/20 poll.

Var. A. With a broad fascia cutting the body whorl.

Var. B. Yellowish ground color, with few markings.

Animal of a bluish slate, deeper on the head and tentacles, and on the posterior part of the foot above; longer than the shell; bottom of foot greenish white, mantle black.—Newc.

Unfortunately the type figured in the Zoological Proceedings is not the usual pattern of the shell, but is one of the more uncommon varieties.—Newc.

This species approaches *A. turgida*, but is distinct in appearance, locality and habits.—Newc.

Hab. District of Ewa.—Newc. Helemano to Wahiawa.

Dr. Newcomb places *A. valida* Pfr. and *A. apicata* Newc. as synonyms of this shell. *A. swiftii* forms a connecting link between the many shells of the *forbesiana* group and those of the *lugubris* group.

29. Achatinella apicata Newcomb.

A. apicata Newc. P. Zool. Soc. London, 1855, p. 210.

A. testa imperforata, globoso-conica, solida, lævigata, nigricante vel fusca, pallide irregulariter radiata et subfasciata; spira conica, apice acutiuscula, cinnamomea vel hepatica; anfr. 6, superis planis, penultimo convexo, ultimo globoso, 2-5 longitudinis vix æquante; apertura obliqua, subtetragono-ovali; plica colum. supera, dentiformi, lilacea; perist. recto, intus lilaceo-labiato, margine colum. perdilatato, incrassato, adnato. Long. 18 1-2, diam. 12 mill.

Shell imperforate, globosely conical, solid, smooth, blackish or brown, irregularly striped and banded with lighter color; spire conical, apex somewhat acute, yellowish or purplish brown; whorls 6, the upper flat, next to the last convex, and last globose, hardly equal to 2-5 of the length; aperture oblique, subquadrangularly oval; columella fold high, tooth-like, lilac; lip erect, margined within with lilac, somewhat dilated at the margin of the columella, thickened, adnate.

Hab. H. I.—Newc. Wahiawa and Helemano.

The sutural band is generally colored red or black, and the shell is usually dextral.

30. Achatinella gulickii Smith.

Apex gulickii Sm. P. Zool. Soc. London, 1873, p. 78; pl. ix, fig. 19.

Testa sinistrorsa (interdum dextrorsa), globoso-conica, nitida, incrementi lineis (haud spiralibus) striata, dilute brunnea, cinereo strigata, zona alba ad peripheriam cincta; sutura brunneo marginata; spira leviter concava; anfract. 6, primi 3–4 pallidi, convexiusculi, cæteri convexi; apertura alba, recedens; perist. paululum dilatatum, intus incrassatum, dilute roseo-fusco tinctum; plica columellaris mediocriter valida, albida. Long. 19, diam. 13 mill.

Var. Testa dextrorsa; anfract. primi 3 pallidi, sequentes 2 et anfract. ultimi dimidium superius cinereo-fusco strigati, dimidium inferius flavum, cinereo-fusco zonatum.

Shell sinistral (sometimes dextral), globose-conic, shining, striated with lines (not spiral) of growth, pale brown, striped with gray, encircled at the periphery by a white band; suture margined with brown; spire slightly concave; whorls 6, the first 3–4 pale, somewhat convex, the others convex; aperture white, receding; lip slightly dilated, thickened within, colored with pale rose-brown; columellar fold moderately strong, whitish.

Var. Shell dextral; first 3 whorls pale, the following 2 and the upper half of the last whorl striped with gray-brown, the lower half yellow, banded with gray-brown.

Affinities. It is allied to *A. apicatus* Newc., and *A. lilaceus* Gk.

Remarks. In Ahonui two-thirds of the specimens are sinistral; in Kalaikoa only about one-eighth are sinistral.—Sm.

Hab. Most abundant in Kalaikoa and Ahonui, but it is sometimes found in valleys to the west as far as Waialee.—Sm.

31. Achatinella valida Pfeiffer.

A. valida Pfr. P. Zool. Soc. London, 1855, p. 6; pl. xxx, fig. 24.

A. testa imperforata, dextrorsa (rarius sinistrorsa), ovato-conica, solida, sublævigata, cinereo-fusca, pallide subfasciata et nigro strigatula; spira elevata, conica, apice fusca, acuta; sutura marginata, alba; anfr. 6, primis 3 planis, sequentibus convexiusculis, ultimo 2-5 longitudinis subæquente, inflato; apertura obliqua, truncato-auriformi; plica columellari supera, nodiformi, parum torta; perist. fusco limbato, margine dextro subrecto, strictiusculo, columellari dilatato, appresso. Long. 21 1-2, diam. 13 mill.

B. Nigra, pallide interrupte lineolata vel fasciata.

Shell dextral (more rarely sinistral), imperforate, ovately conical, solid, smooth, ashy brown with fine pale bands and black stripes; spire elevated, conical, apex brown, acute; suture margined, white; whorls 6, first three flat, the following somewhat convex, the last inflated, equal to 2-5 of the length; aperture oblique, truncate-auriform; columellar fold high, nodiform, slightly twisted; lip margined with brown, nearly erect at the right margin, somewhat constricted, expanded at the columella, appressed.

Hab. H. I.—Frick. Helemano to Waialee.

Mr. Baldwin places this with *A. swiftii* Newc.

Dr. Cooke found the type shells to be longer and narrower than the typical *swiftii*, and it may come from the Waianae side of Waialua.

32. Achatinella cinerosa Pfeiffer.

A. cinerosa Pfr. P. Zool. Soc. London, 1855, p. 2, pl. xxx, fig. 5.

A. testa dextrorsa, imperforata, ovato-conica, solida, sublævigata, nitida, fusco-grisea, lineis fuscis et albis radiata; spira conica, apice acutiuscula, alba; sutura subcrenulata, albo-marginata; anfr. 6, vix convexiusculis, ultimo spira paulo breviore, basi rotundato; apertura parum obliqua, truncato-auriformi; plica columellari torta, valida, dentiformi; perist. crasse albo-labiato, margine dextro substricto, breviter expanso, columellari crasso, adnato. Long. 21, diam. 11 mill.

B. Fulvida, fusco radiata, sutura concolore.

Shell dextral, imperforate, ovately conical, solid, smooth, shining, brown-gray, striped with brown and white lines; spire conical, apex somewhat acute, white; suture subcrenulate, white-

margined; whorls 6, hardly convex, the last a little shorter than the spire, rounded at the base; aperture slightly oblique, truncately auriform; columellar fold twisted, strong, tooth-like; peristome thickly white-lipped, right margin constricted, expanded a little, thickened at the columella, adnate.

Hab. Helemano.

This seems to be only another form of *A. swiftii* Newc.

33. Achatinella lilacea Gulick.

Apex lilaceus Gk. P. Zool. Soc. London, 1873, p. 79, pl. x, fig. 4.

Testa dextrorsa, globosa-conica, nitida, incrementi lineis (haud spiralibus) striata, lilaceo-cervina, albida strigata; sutura dilute marginata; anfract. 6, primi 3 subplani, albi, cæteri convexi; anfract. ult. medio interdum obscure obtusatim angulatus; apertura albida; perist. dilute roseo-fuscum, paululum dilatatum, intus incrassatum; plica columellaris valida, pallide rosea. Long. 21, diam. 12 1-2 mill.

Shell dextral, globosely conical, shining, striated with lines of growth (not spiral), lilac-fawn, whitish striped; suture lightly margined; whorls 6, first three nearly flat, white, the others convex; the last whorl sometimes obscurely obtusely angled at the middle; aperture whitish; lip pale rose-brown, very slightly expanded, thickened within; columellar fold strong, pale rose.

Affinities. It is readily distinguished from *A. apicatus* Newc. by the color of the apex, which is chestnut in that species, but white in this. Sinistral specimens are very rare.—Gk.

Hab. The metropolis of the species is Ahonui, on Oahu. It is also abundant in Kalaikoa, but becomes very rare in Wahiawa, Helemano and Kawailoa.

34. Achatinella vespertina Baldwin.

A. vespertina Bald. P. Ac. Phil., 1895, p. 219, pl. x, fig. 14.

Shell dextral, minutely perforated, solid, globose, with the spire conical, lateral outlines slightly concave, apex subacute; surface shining, striated with delicate growth lines; apical whorls smooth. Of a uniform delicate cream color, lighter on the upper whorls and sutures; sometimes with a few faint, white transverse lines on the lower whorl. Whorls 6, narrowly margined above, the first three plain, the rest slightly convex, the last somewhat inflated; suture lightly impressed. Aperture very oblique, oval, white within; peristome white, acute, thickened within, somewhat expanded, the basal margin slightly reflected, the columellar margin forming a sinuous ridge around the umbilicus, extremities united by a very thin callosity; columella terminating in a strong, round, white tubercle. Length 21, diam. 14 1-2 mill.

Animal when extended in motion, longer than the shell. Mantle and tentacles brown, the latter with the head above, of darker shade. Foot light yellow, the superior portion of darker hue.

The nearest allied species is *A. swiftii* Newc.; but the shape and color of the shell, separate habitat, and difference of animal, entitle it to rank as a distinct species.

The native Hawaiians firmly believe in the power of the Achatinella to produce musical sounds. Hence the Hawaiian name, "pupu kanioe," singing shells. Their legends ascribe to them a vesper song.—Bald.

Hab. Kawailoa.—Bald.

PERVERSA GROUP.

35. Achatinella perversa Swainson.

A. perversa Swain. Zool. Ill., iii, p. 99, fig. 2, 1832.

A. testâ sinistrorsâ, sub trochiformi, fuscâ faciis transversis nigricantibus lineisque longitudinalibus; apice suturâque albis.

Shell reversed, subtrochiform, fulvous brown, with darker transverse bands, and longitudinal lines; apex and suture white.

Shell less trochiform, but somewhat larger than the last [*A. pica* Swain.]. The terminal whorls of the spire are likewise formed in the same manner; these, together with the suture, the pillar, and the aperture, are pure white. The rest of the shell is a drab-coloured brown, variegated by transverse blackish bands and lines; and sometimes by others, in a waved direction, near the suture. The spiral line, which follows the suture, and the tip of the shell, both of a pure white, renders this a very elegant species.—Swain.

Animal long as the shell; light grey color, tentacles and sheath light brown with a bar of brown across the front, upper tentacles alone clavate, strongly swelling at their base; granulations large. There are several varieties of this species, one of which has so near an approach to *A. decora*, as to lead to their being confounded with each other. They are, however, widely separated in locality, and the animals are even more distinct in markings and habits than the shells themselves.—Newc.

Hab. Helemano to Kawailoa.

The following three species, although not closely related to *A. perversa*, are placed in this group on account of their geographical position. This grouping of the shells is intended largely as an aid in cabinet arrangement.

36. Achatinella napus Pfeiffer.

A. napus Pfr. P. Zool. Soc. London, 1855, p. 5, pl. xxx, fig. 19.

A. testa imperforata, dextrorsa, turrita, solida, striatula, nitidula, albida, fasciis griseo-carneis et interdum lineis castaneis cingulata; spira elongato-conica, apice alba, acuta; sutura distincte marginata; anfr. 6 1-2, superis planis, sequentibus convexiusculis, ultimo 1-3 longitudinis subæquante, rotundato; apertura diagonali, truncato-auriformi; plica columellari supera, mediocri, leviter torta; perist. intus labiato, margine dextro recto, columellari subdilatato, adnato. Long. 19 1-2, diam. 10 1-2 mill.

Shell dextral, imperforate, turrited, solid, somewhat striated, shiny, whitish, encircled with grayish flesh-colored bands and sometimes chestnut lines; spire elongate-conic, apex white, acute; suture distinctly margined; whorls 6 1-2, the upper flat, the following somewhat convex, the last nearly equal to 1-3 the length, rounded; aperture diagonal, truncate-auriform; columellar fold high, not large, lightly twisted; peristome thickened within, right margin erect, somewhat expanded at the columella, adnate.

Hab. Waialee.—Bald.

Dr. Cooke found the type shell rather narrow for a shell of this section. The third and fourth whorls are light brown, with broad and narrow white or light brown bands; the suture is brown.

37. Achatinella leucozona Gulick.

Apex leucozonus Gk. P. Zool. Soc. London, 1873, p. 83; pl. x, fig. 6.

Testa subperforata, dextrorsa, globoso-conica, nitida, incrementi lineis (haud spiralibus) striata, griseo-brunnea, saturate griseo-brunneo strigata, ad peripheriam zona alba interrupta; sutura distincte albo marginata; spira recte conica; anfract. 6, primi 3 convexiusculi, cæteri convexi; apertura alba; perist. paululum dilatatum, dilute roseo-fusco tinctum, intus incrassatum; plica columellaris valida, alba. Long. 19, diam. 12 mill.

Shell subperforate, dextral, globose-conical, shining, striated with lines of growth (not spiral), grayish-brown, striped with dark grayish-brown, separated at the periphery by a white band; suture distinctly margined with white; spire decidedly conical; whorls 6, first three slightly convex, the others convex; aperture white; lip very slightly dilated, tinged with rose-brown, thickened within; columellar fold strong, white.

Affinities. It is related to and passes into *A. napus* Pfr., which is also found in Waialee; but the usual forms are distinguished by having a shorter spire and a white suture, and in being free from the yellowish hue of that species.

Remarks. This species is always dextral.—Gk.

Hab. The metropolis of this species is in Waialee. A few specimens have also been found in Wahiawa.—Gk.

38. Achatinella leucophæus Gulick.

Apex leucophæus Gk. P. Zool. Soc. London, 1873, p. 82, pl. ix, fig. 16.

Testa sinistrorsa, subperforata, ovato-conica, parum nitida, incrementi lineis et transversim indistincte exilissime striata, dilute cervina, dilute fusco strigata et zonata; sutura distincte albo marginata; anfract. 7, subconvexi; apertura alba; perist. paululum dilatatum, intus valide incrassatum, dilute fusco tinctum; plica columellaris valida, albida, aliquanto reflexa, rimam parvum fere tegens. Long. 22, diam. 12 mill.

Shell sinistral, subperforate, ovate-conical, hardly shining, transversely, indistinctly and very finely striated with lines of growth, light fawn, striped and banded with light brown; suture distinctly margined with white; whorls 7, subconvex; aperture white; lip slightly dilated, strongly thickened within, tinged with light brown; columellar fold strong, whitish, somewhat reflexed, almost concealing the small cleft.

Affinities. It is allied to *A. perversus* Swn., and *A. validus* Pfr., but it is of a paler colour and more elongate form.

Remarks. It is always sinistral.—Gk.

Hab. Waialee.—Gk.

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2. *Waianae Mountains, Oahu.*

MUSTELINA GROUP.

39. Achatinella mustelina Mighels.

A. mustelina Migh. P. Boston Soc., ii, 1845, p. 21.

Shell dextral, conical, dark brown, with a light revolving band at the suture, perforate; whorls 7, convex; aperture oblong; lip simple, acute. Length 1, diam. 9/20 inch.

Animal of a grass-green, through different shades more or less intense; tentacles light slate.

A very curious variety of this shell is met with, in form resembling *A. decora*. It is polished, of a roseate, ashy hue above, and the inferior half of the last whorl deep brown or black. The

animal is, however, identical with *A. mustelina*, and it is met with in the mountains of Waianae, on the island of Oahu, the central region for *mustelina*.—Newc.

Hab. Waianae Mts.—Migh. Mt. Kaala.—Bald.

40. Achatinella multilineata Newcomb.

A. multilineata Newc. P. Zool. Soc. London, 1853, p. 138; pl. xxii, fig. 23.

Shell dextral or sinistral, solid, elongately conical, whorls 6, rounded, margined above; lip expanded below and slightly subreflected, above acute and thickened within; columella short, stout, slightly twisted, with a callus spread over and nearly closing the umbilicus; aperture oblong-ovate; colour of columella, lip and suture white, sometimes tinged with yellow; shell white, with or without numerous transverse lines of a brown or black colour. Long. 19/20, lat. 10/20 poll.

This species makes a near approach to *A. mustelina* of Mighels, but is more elongate in form, with the lineations much stronger, and never passes into the variety of *mustelina* with the depressed spire and obese body whorl. The locality is also different, which is always worthy of particular remark in examining the shells of this genus.—Newc.

Hab. Kolaupoko.—Newc. Northeast side Mt. Kaala.

41. Achatinella bicolor Gulick.

A. bicolor Gk. Pfeiffer, Mon. Hel. Viv., iv, 1859, p. 529.

T. subperforata, globoso-conica, solida, leviter striata, nitida, albida, fusculo oblique strigata; spira conica, apice acutiuscula, alba; sutura late impresso-marginata; anfr. 5 1-2, superi plani, penultimus convexior, ultimus spiram fere æquans, globosus, infra peripheriam nigro-castaneus; apertura obliqua, subauriformis; plica columellaris alta, nodiformis; perist. intus labiatum, fusco-limbatum, margine dextro breviter expanso, columellari dilatato, subadnato. Long. 16 1-2, diam. 11 mill. Ap. 8 1-2, mill. longa, 5 lata.

Shell subperforate, globose-conical, solid, lightly striated, shining, whitish, obliquely striped with brown; spire conical, apex somewhat acute, white; suture broadly impressed-margined; whorls 5 1-2, the upper flat, the next to the last somewhat convex, the last globose, almost equal to the spire, black-chestnut below the periphery; aperture oblique, subauriform; columellar fold prominent, nodiform; lip thickened within, edged with brown, the right margin shortly expanded, dilated at the columella, subadnate.

Hab. Lihue.—Pfr. Waianae Mts.

42. Achatinella sordida Newcomb.

A. sordida Newc. P. Zool. Soc. London, 1853, p. 139; pl. xxiii, fig. 27.

Shell elongately conical, solid; whorls 7, slightly rounded, margined above; aperture small, somewhat contracted; lip subreflected below, acute above, thickened within; columella short, slightly twisted, with an expanded callus partially covering a shallow small umbilicus; colour variable; ground white, variously banded and striped transversely with brown or black. Long. 18/20, lat. 9/20 poll.

This species, like the *A. multilineata*, is drawn from the group of *A. mustelina*, the variations in character, with different localities and the peculiarity of habits in each, demanding their separation.—Newc.

Hab. Lihue.—Newc. Waianae Mts.

43. Achatinella concavospira Pfeiffer.

A. (*Bulimella*) *concavospira* Pfr. P. Zool. Soc. London, 1859, p. 30.

T. subperforata, dextrorsa, ovato-turrita, solida, striatula, nitida, albida, fasciis et strigis angustis coffeaceis ornata; spira concavo-turrita, apice acutiuscula, alba; sutura valde marginata; anfr. 7, primi 3 plani, sequentes convexi, ultimus rotundatus, 2-5 longitudinis subæquans; plica columellaris supera, nodiformis, alba; apertura obliqua, obauriformis; perist. hepaticum, margine dextro expansiusculo, columellari perdilatato, reflexo, subadnato. Long. 21 1-2, diam. 11 1-3 mill.

Shell subperforate, dextral, ovate-turreted, solid, somewhat striated, shining, whitish, ornamented with narrow coffee-colored bands and stripes; spire concave-turreted, apex slightly acute, white; suture strongly margined; whorls 7, first three flat, the following convex, the last rotundate, nearly equal to 2-5 the length; columellar fold high, nodiform, white; aperture oblique, nearly auriform; lip liver-colored, with the right margin slightly expanded, greatly dilated at the columella, reflexed, subadnate.

Hab. Waianae Mts., eastern range.

44. Achatinella turbiniformis Gulick.

Apex turbiniformis Gk. P. Zool. Soc. London, 1873, p. 81, pl. x, fig. 7.

Testa dextrorsa subperforata, subgloboso-conica, parum nitida, incrementi lineis (haud spiralibus) striata; alba, lineis paucis transversis fuscis basim versus cincta; sutura distincte marginata; spira leviter concava; an-

fract. 6, primi 3 convexiusculi, cæteri convexi; apertura alba; perist. margine tenui, dilute fusco intus limbatum; plica columellaris mediocriter valida. Long. 17, diam. 11 mill.

Shell dextral, subperforate, subglobosely conic, hardly shining, striated with lines (not spiral) of growth; white, encircled towards the base with a few transverse brown lines; suture distinctly margined; spire slightly concave; whorls 6, first 3 slightly convex, the others convex; aperture white; lip thin at the margin, edged within with light brown; columellar fold moderately strong.

It is allied to *A. tuberans* Gk., but has a much narrower spire.

Remarks. All the specimens found are dextral.—Gk.

Hab. Kalaikoa and Lihue.—Gk. Waianae Mts.—Bald.

The habitat of this shell is rather doubtful, so that it is difficult to place with any certainty; probably from the Lihue side of the Waianae Mts.

II.

Section **ACHATINELLASTRUM** Pfeiffer.

Beginning with the Southeastern end of Oahu.

FULGENS GROUP.

45. **Achatinella fulgens** Newcomb.

A. fulgens Newc. P. Zool. Soc. London, 1853, p. 131, pl. xxii, fig. 24, 24*a*.

Shell elongately conic, polished, shining; whorls 6, flatly convex; suture slightly impressed; aperture ovate; columella short, tuberculated; lip simple, ribbed within; colour rich chestnut-brown, with a broad white sutural fascia cutting the centre of the last whorl; apex and columella white. Long. 18/20, lat. 8/20 poll.

Var. A. White, with broad chestnut bands.

Var. B. Chestnut-coloured above, yellowish below, with two black and one white band, the columella dark brown; of large size, measuring 22-20×10-20 of an inch.

This last variety may, upon further examination, prove to be a distinct species. The locality of this last is Makiki Valley, "Mauka roa," or far back in the mountain range. An examination of the respective animals will resolve the doubt.—Newc.

Hab. Niu.—Newc.

This and the following seven species are very nearly related, and form a very interesting group. They are all found in the district between Niu Valley and Makiki; all are sinistral, and the great number of color varieties run one into the other. Over one thousand examples of this varied group are in the author's collection.

46. **Achatinella buddii** Newcomb.

A. buddii Newc. P. Zool. Soc. London, 1853, p. 155; pl. xxiv, fig. 73.

Shell sinistral, conically ovate, solid; whorls 6, convex, slightly margined above; suture moderately impressed, banded with white; aperture ovate; lip acute, thickened within; col-

umella short, with a terminal plication ; colour yellowish (or cinnamon), slate or fawn ; columella and aperture white. Long. 16/20, lat. 9/20 poll.

This uncommon species I take pleasure in dedicating to Dr. B. W. Budd of New York, who has largely contributed in assisting others to build up a scientific reputation in the United States. —Newc.

Hab. Palolo.—Newc.

A. buddii, as found today, seems to agree well with the original type, except that it often lacks the black spot found on the tip of the older shells.

47. Achatinella phæozona Gulick.

A. phæozona Gk. Ann. Lyc. New York, vol. vi, p. 215, pl. vii, fig. 40.

Shell sinistral, scarcely perforate, oblong-ovate, solid, shining, striated, white, with from 1 to 6 black or chestnut bands varying in width ; apex subacute ; spire convexly conical ; suture marginate, moderately impressed ; whorls 7, moderately convex ; columellar fold central, white, strong ; aperture a little oblique, lunately rounded ; peristome acute, well thickened within ; with columellar margin dilated, adnate, or sometimes slightly detached; parietal margin wanting.

Length 0.86 in. (22 mill.), breadth 0.50 in. (12 2-3 mill.).

Length of body whorl 0.64 in. (16 1-4 mill.).

Length of aperture 0.43 in. (11 mill.): an average sized specimen.

Length of a large specimen 1.20 in. (25 2-5 mill.).

Average weight 10.50 grains.

Station. On the Kukui (*Aleurites triloba*) and Ki (*Cordyline terminalis*).

Var. A. With one broad band encircling the base.

Var. B. With two dark bands, one entering the aperture, the other revolving above the suture. This and Var. A are sometimes found in Kailua, Oahu.

Var. C. White, with three or four bands at the base.

Var. D. Without bands, but more or less streaked with fawn-brown.

Var. E. Dark brown, with two white bands, one sutural, the other on the periphery of the body whorl.

Var. F. Brown, with one or more black bands.

Var. G. Ash or olive-brown, with one or more light bands.

Var. H. Chestnut or olive-brown, with fine black spiral lines.

Smaller, with outlines of spire less convex; passing into *A. plumata*. Average weight 5.30 grains.

Var. I. White, with numerous chestnut bands on the lower part of the whorls.

Var. J. Light olive-brown, with dark bands.

Var. K. Dark brown, with narrow white bands.

Var. L. White, with one or two broad black bands at the base.

Var. M. Elongate, white, with two black bands, one revolving above the suture, the other entering the aperture, sometimes a third accompanies the sutural margin.

Var. N. White, with from three to five crowded bands at base.

Var. O. Pure white.

Remarks. May be grouped with *A. buddii* and *A. fulgens* Newc., but differs in its more solid structure, its thicker lip and columellar fold, and in the more convex outline of its spire. It also lacks the black tip which characterizes *A. buddii*. The typical varieties found in Keawaawa are rare, the sterile regions affording but few trees, which occupy the ravines near the summit of the ridge.

The varieties of Kailua (I, J and K) pass into *A. plumata* Nob.; and var. M of Olomana bears a strong analogy to *A. zonata* Nob. and *A. formosa* Nob., which are found at the opposite end of the mountain range constituting the backbone of the island.—Gk.

Hab. Species, and varieties A–H, Keawaawa; vars. I–K, Kailua; vars. L–O, Olomana.—Gk.

48. Achatinella plumata Gulick.

A. plumata Gk. Ann. Lyc. New York, vol. vi, p. 217, pl. vii, fig. 41.

Shell sinistral, imperforate, ovate-conic, solid, shining, striated, cinereous, with oblique brown streaks; apex subacute, spire conic; with outlines slightly convex: suture marginate, moderately impressed, white; whorls 6 1-2, somewhat convex; columellar fold central, white, strong; aperture somewhat oblique, truncately auriform; peristome subacute, well thickened within; with columellar margin dilated, adnate; parietal margin wanting.

Length 0.90 in. (23 mill.); breadth 0.48 in. (12 1-5 mill.).

Length of body whorl 0.63 in. (16 mill.).

Length of aperture 0.44 in. (11 mill.).

Average weight 8.50 grains.

Var. B. Bluish grey, suture of the same color, lip thinner.

Var. C. Of ashy chestnut color, with black bands.

Var. D. Pale, streaked with light fawn-brown, sutures white.

Var. E. Irradiated with light brown, sutures the same, lip less thickened, columellar fold tuberculate.

Var. F. With one or two broad chestnut bands, otherwise like var. E.

Var. G. With three bands, usually black, one of which is sutural.

Var. H. With a white belt encircling the base between two broad black bands, one of which enters the aperture.

Var. I. White or yellowish at the base, reddish-gray above, with a dark spiral line between.

Var. J. Fawn-colored, darker towards the apex.

Var. K. Greyish pink mounted with brown, yellow at the base.

Smaller and more elongately ovate. Length 0.77 in. (19 1-5 mill.); breadth 0.41 in. (10 2-5 mill.).

Var. L. Grey radiated with black and brown, with sutures white.

Var. M. Streaked with grey and brown with sutures of the same color.

Var. N. Dark chestnut, lighter towards the apex.

Var. O. White with two or three broad black or chestnut bands.

Var. P. Of cinnamon color with one black band at the base.

Var. Q. Plumbeous above, greenish yellow at the base.

Of full size, but thinner than the typical varieties, with the first three whorls usually white; pass into *A. fulgens* Newc., which is found in the same locality.

Var. R. Of greyish-fawn color, with sutures white.

Var. S. Cinnamon or chestnut, variously banded with dark or pale lines; one specimen dextral.

Var. T. Brownish grey, with one or more black bands at base.

Var. U. Cinereous, with numerous pale spiral lines.

Var. V. Cinereous above, passing into dark brown on the periphery of the body whorl and greenish yellow at the base.

Var. W. Of a grayish-yellow hue throughout.

Var. X. Bright fawn color, with a broad white belt on the periphery of the last whorl.

Rather thin with lip acute and scarcely thickened within; pass into *A. buddii* Newc., found in the same locality. Average weight 5.30 grains.

Var. Y. Dark brown or cinnamon throughout.

Var. Z. Grey, with fine black lines.

Var. AA. Yellowish white or grey, with two broad black or chestnut bands, one entering the aperture.

Var. BB. Brown or slate, with two white bands, one sutural, the other on the periphery of the whorl.

Var. CC. Greyish pink, with one or two broad white bands at the base.

Var. DD. Grey above, yellow at the base.

Var. EE. White, with broad pale bands of grayish pink.

Var. FF. Fawn, with a narrow black band entering the aperture, and sometimes with a dark sutural line.

Var. GG. White or pale greyish pink, with one or two narrow slate or chestnut bands.

Var. HH. White above, brown at the base.

Var. II. Bright chestnut, with white sutures, light pink columella.

*

With spire more convex and colors less streaked; pass into *A. phœozona*, vars. I–O.

Var. JJ. Light brownish grey, with several black spiral lines.

Var. KK. Brown or slate colored, with two white bands, 1 sutural, the other on the periphery of the last whorl.

Var. LL. With a broad black zone at the base.

Var. MM. Olive brown, with 2 dark bands, a broad one entering the aperture, the other narrower, revolving above the suture.

Var. NN. Light fawn, with 1 or 2 white bands at the base.

Var. OO. White, with oblique yellowish streaks.

Var. PP. Fawn-colored, plain or with dark brown bands; sutures white; approaches *A. cervina* Nob.

Remarks. A neat species, differing from *A. phœozona* in its smaller size, more conic spire, and in the streaked arrangement of its colors. The typical specimens are much thicker and heavier than *A. buddii* Newc., and it never has the black tip of that species. We have seen but one dextral specimen, which has been mentioned under var. S.

Hab. Species, and varieties B–K, Niu; var. L–Q, Wailupe; vars. R–X, Waialae; (vars. R, S and V are sometimes found in Palolo;) vars. Y–II, Palolo; vars. JJ–PP, Kailua.—Gk.

49. Achatinella versipellis Gulick.

A. versipellis Gk. Ann. Lyc. New York, vol. vi, p. 224, pl. vii, fig. 44*a* and 44*b*.

Shell dextral or sinistral, imperforate, acuminately oblong, solid, shining, striated, of lively ash-color, more or less streaked and waved with brown, with several interrupted brown bands on the upper parts of the whorls; apex somewhat obtuse; spire convexly conical; suture margined, moderately impressed; whorls 6, convex; columellar fold central, white, strong; aperture truncately auriform, white within, a little oblique, in sinistral specimens very oblique; peristome thickened within; with external margin unreflected, compressed, edged with brown; columellar margin dilated, adnate; parietal margin wanting.

Length 0.80 in. (20 1-3 mill.), breadth 0.40 in. (10 mill.).

Length of body whorl 0.59 in. (15 mill.).

Average weight 8.60 grains.

Station. Principally on the leaves of the Ki (*Cordyline terminalis*) and Ieie (*Freycinetia scandens*).

Var. B. Rich brown, with light streaks and waves.

Var. C. Yellow at the base, with one or more brown bands above.

Var. D. Yellow at the base, and white above, without bands.

Var. E. Nearly pure white.

Var. F. Ash or yellow gray, without bands.

Remarks. A rare and beautiful species, found in the most rugged but verdant regions of western Kailua. About a third of the specimens are sinistral.

Hab. Pohakunui, in Kailua.—Gk.

Found on the other side of the island, but perhaps related to the shells of the *fulgens* group.

50. Achatinella pexa Gulick.

A. pexa Gk. Ann. Lyc. New York, vol. vi, p. 197, pl. vi, fig. 26.

Shell sinistral, deeply perforated, ovate-conic, thin, shining, finely striated, microscopically very minutely decussated; ash-colored, streaked with white and brown, and banded with brown spiral lines; apex subacute; spire conical; suture simple, slightly impressed; whorls 6, somewhat convex; columella white, obso-

letely plaited; aperture oblique, truncately oval, light brown within; peristome scarcely thickened within; with external margin anteriorly reflected, arcuate; columellar margin dilated, not appressed; parietal margin wanting.

Length 0.76 in. (19 1-3 mill.), breadth 0.42 in. (10 2-3 mill.).
Length of body whorl 0.53 in. (13 1-2 mill.).
Weight 2.50 grains.

Remarks. Somewhat resembles *A. buddii* Newc., in style of coloring, but lacks the black tip of that species, and decidedly differs in the reflected lip, and deeply perforated umbilicus.

Hab; Hawaiian Ids.—Gk. Niu.

51. Achatinella fuscozona Smith.

A. fuscozona Sm. P. Zool. Soc. London, 1873, p. 76; pl. ix, fig. 9.

Testa sinistrorsa, ovato-conica, perforata, parum nitida, incrementi lineis et transversim (sub lente) minutissime striata, albida, plusve minusve dilute fusco oblique strigata, transversimque obscure lineata vel zonata; sutura distincte fusco marginata, anfract. 6 1-2, convexi, ult. amplus; apex nigrescens; apertura alba; perist. tenue, intus leviter limbatum; plica columellaris valida, rubescens (interdum albida). Long. 21, diam. 12 mill.

Var. Testa elongato-conica; sutura zona latissima fusca cincta. Long. 23 1-2, diam. 11 mill.

Shell sinistral, ovately conic, perforate, hardly shining, transversely and very minutely striated with lines of growth, whitish, more or less obliquely striped with light brown, and transversely obscurely lined or banded; suture distinctly margined with brown, whorls 6 1-2, convex, the last broad; apex blackish; aperture white; lip thin, lightly edged within; columellar fold strong, red (sometimes whitish).

Var. Shell elongately conic; suture encircled with a very broad brown band.

Affinities. It is intermediate between *A. adusta* Rve. and *A. buddii* Newc.

Hab. Makiki, on Oahu; two or three specimens have been found in Palolo.

Mr. Baldwin places this shell with *A. buddii* Newc. It is also very near to *A. pexa* Gk. Dr. Cooke found the type shell to be a white variety of *A. buddii*.

52. Achatinella augusta Smith.

A. augusta Sm. P. Zool. Soc. London, 1873, p. 74; pl ix, fig. 7.

Testa sinistrorsa, ovato-conica, nitida, incrementi lineis et transversim exilissime striata, viridis, saturate viridi strigata lineisque spiralibus viridibus rufisque obscuris cincta, infra suturam albam zona flava ornata; sutura

distincte albo marginata; anfract. 6 1-2, primi 4 convexiusculi, cæteri convexi; apertura alba; perist. tenue, intus dilute fusco tinctum; plica columellaris valida, fusco-rosea. Long. 24, diam. 12 1-2 mill.

Var. Testa omnino flava, suturam infra zona alba cincta.

Shell sinistral, ovate-conical, shining, transversely and finely striated with lines of growth, green, striped with dark green, and encircled with green and faint red spiral lines, ornamented by a yellow band below the white suture; suture distinctly margined with white; whorls 6 1-2, first 4 slightly convex, the others convex; aperture white; lip thin, tinged with light brown within; columellar fold strong, rose-brown.

Var. Shell entirely yellow, encircled by a white band below the suture.

Affinities. This species is, on the one hand, closely related to *A. plumata* Gk., from which it is distinguished by its green and yellow epidermis, which is entirely wanting in that species, and to *A. fulgens* Newc., from which it differs in being without the broad black bands, which belong not only to the epidermis, but to the solid part of the shell of *A. fulgens*. It has been described by Newcomb and Pfeiffer as a variety of the latter species.

Hab. Palolo and Wailupe.—Sm.

DIVERSA GROUP.

53. Achatinella diversa Gulick.

A. diversa Gk. Ann. Lyc. New York, vol. vi, p. 220, pl. vii, fig. 42*a* and 42*b*.

Shell sinistral, very rarely dextral, imperforate, ovately or elongately conic, solid, shining, striated, white or variously painted with yellow or green; apex subacute; spire conic; suture marginate, moderately impressed; whorls 6 1-2, somewhat convex; columellar fold central, strong, rose or white; aperture oblique, truncately auriform; peristome acute, thickened within; with columellar margin dilated, adnate; parietal margin wanting.

Length 0.83 in. (21 mill.), breadth 0.45 in. (11 2-5 mill.).

Length of body whorl 0.61 in. (15 1-2 mill.).

Length of aperture 0.42 in. (10 2-3 mill.); an average specimen.

Greatest length 0.99 in. (25 mill.).

Average weight 8.00 grains.

Var. A. Pure white, except the columella, which is frequently lilac or rose. Pl. vii, fig. 42*a*.

Var. B. White, with one black band. Pl. vii, fig. 42*b*.

Var. C. White, with two dark bands, one entering the aperture. Approaches *A. fulgens* Newc.

Var. D. White, with yellow or green base.

Var. E. Yellow, with white bands.

Var. F. Yellow, fading towards the apex.

Var. G. Green, fading towards the apex.

Var. H. Green, passing into gray or brown towards the apex.

Var. I. Green, with white bands.

Remarks. Differs from *A. plumata* Nob. in the character and arrangement of its colors, and from *A. fulgens* Newc. in the absence of the white sutural band, and the two broad black central bands which characterize that species.

The specimens found in Niu do not present the green varieties, but incline more to white; and are also thicker and more ovate in form than those found in Palolo. The average weight of full grown specimens from Niu is about 9.00 grains, that of the Palolo specimens is 7.20 grains.

I have six or eight dextral specimens belonging to varieties D, E, G and I.—Gk.

Hab. Palolo, Waialae, Wailupe and Niu.—Gk.

The author's own collection exhibits a fine series of these beautiful shells. Many of the various color varieties form connecting links with other groups; the shell has been well named.

54. **Achatinella trilineata** Gulick.

A. trilineata Gk. Ann. Lyc. New York, vi, p. 226, pl. vii, fig. 46.

Shell sinistral, imperforate, ovate-conic, solid, shining, finely striated, white above, yellow or green at the base, with three black bands, one sutural, one entering the aperture, and the other between the two, revolving just above the suture; apex somewhat obtuse; spire conical, slightly convex; suture with narrow margin, moderately impressed; whorls 6 1-2, rather convex; columellar fold central, white or rose, strongly developed; aperture truncately auriform, white within; peristome thickened within, with external margin unreflected, arcuate, acute; columellar margin dilated, adnate; parietal margin wanting.

Length 0.85 in. (21 3-5 mill.), breadth 0.48 in. (12 mill.).

Length of body whorl 0.59 in. (15 mill.).

Average weight 8.60 grains.

Var. B. With oblique reddish brown streaks above, the base green or yellow.

Var. C. Yellowish or green throughout, excepting the bands.

Var. D. White at the base, and also above.

Var. E. Covered with oblique reddish-brown streaks.

Var. F. Apex tipped with black, passing into *A. buddii* Newc.

Var. G. Green or yellow, except the black bands, and a narrow line of white.

Var. H. White, with several fine spiral black lines accompanying the broader bands.

Var. I. With black bands very broad, occupying half the surface or more.

Var. J. With two black bands, one sutural, the other passing above the suture.

Var. K. With two black bands, one sutural, the other entering the aperture; rare.

Var. L. With several narrow bands on the upper part of the whorls.

Remarks. Dextral specimens of this species are very rare; I have obtained but two. Varieties J and K have been found only in Palolo. As in the preceding species, the specimens found in Niu are of the lighter colored varieties, and more solid than those of the other valleys.—Gk.

Hab. Palolo, Waialae, Wailupe and Niu.—Gk.

The characteristic feature of this species is its prominent black bands. This and all the color varieties of *A. diversa* are very closely related to the members of the *fulgens* group. The metropolis of all these shells is the territory including the valleys of Niu, Wailupe, Waialae and Palolo. Mr. Gulick, who has given such full descriptions of the species of this and the *fulgens* group, adds the following notes in regard to the species found in this section:

"The variation of the species, both in form and color, and the shading of the varieties of different species into one another, has in many instances been noted; but the affinities are more complicated than would appear from the descriptions. From this cause, together with the perplexity arising from dextral and sinistral varieties, from lack of specimens representing many of the forms of the genus, and from inability to ascertain the geographical relations of the species, unavoidable errors found their way into Reeve's Monograph of the genus, from which confusion has arisen in the nomenclature of the species of this group especially. Additional error has since been introduced, by the description, under new names, of certain specimens of well known shells, which the demand for new and beautiful species had subjected to artificial treatment. So successful was the deception that some are still received as genuine, which I am persuaded belong to this class.

"*A. vulpina* Fér. was described as sinistral species, and accordingly the name was applied to only sinistral specimens. The dextral varieties of this species were described by Reeve under the names of *A. producta* and *A. bilineata*, while the name *vulpina* was transferred by him to another species, which we have described as *A. varia*, to which was added, as a variety, the distinct species *A. livida* Swains., and also by Pfeiffer, *A. stewarti* Green. Other dextral specimens which have been described by Dr. Newcomb under the names *A. venulata* and *A. hybrida*, differ from the dextral type chiefly in the arrangement of the color, which I think are not specific characters, if indeed they are natural. *A. venulata*, Var. A, I take to be the green variety of *A. stewarti*. *A. johnsonii* and *A. aplustre* Newc. are fine specimens of *A. byronii*, the one entirely, and the other partially deprived of its epidermis. The name *A. byronii* has given place to *A. pulcherrima*, which belongs to a species similar in outline, but of very distinct affinities. *A. livida* Swains. is much smaller than *A. vulpina* Fér. and quite distinct. Its allied species are *A. curta*, *recta*, *undulata*, *emersonii* Newc., and *A. glauca* Nob. It has the colored suture of the first, and the greenish lead color of the last two. .....

"The difference between *A. producta* Rve. and *A. vulpina* Fér. is no greater than is constantly found between dextral and sinistral varieties; and *A. bilineata* Rve. has long been considered by Dr. Newcomb and others as only a variety of *A. producta;* there are also sinistral specimens lined in the same manner, which differ from the typical *A. vulpina* in no other respect.

"My specimens of *A. venulata*, *hybrida*, *johnsonii* and *aplustre*, were, I think, from the same source as Dr. Newcomb's, and purported to come from the same locality, which was then yielding many new species. I have since explored all that part of the island, and none of these species were found, nor any whose affinities indicated an approach to the home of such forms. But as I departed from the valleys near Honolulu into Kolau, I found the varieties and species differing more and more from that type. The unavoidable inference is, that instead of being from Kolau, they are from the valleys near Honolulu, where *A. vulpina*, and *stewarti* abound. The strength of this inference will be best appreciated by those who are acquainted with the limited distribution of the groups, as well as of the species of this genus, and the relation between their geographical distribution and the graduation of their types.

"Moreover the peculiar markings of these specimens do not extend within the aperture, where they would also appear if natural. The pink band of *A. aplustre* is cut off abruptly at the aperture, in entire variance from the laws of the arrangement of color which prevail in this genus.

"Dr. Newcomb has followed in restoring *A. livida*, making it include, beside Swainson's type, *A. emersonii* Newc., *A. glauca* Nob., and *A. reevei* Ad. If *A. emersonii* and *glauca* are to be merged in *A. livida*, would not a consistent system of classification require that *A. recta* and *undulata* should likewise be placed under *A. curta*, since the relation is similar?"

VULPINA GROUP.

55. Achatinella vulpina Férussac.

A. vulpina Fér. Prodrome: Limaçons, p. 60, No. 429

Shell acuminately oblong, sinistral, sometimes rather ventricose, whorls somewhat flatly convex, columella short, callous, dentately plicate, lip of the aperture but little thickened; olive or whitish, with oblique light red-brown streaks, variously painted with spiral black or green, or brown bands and lines, columella purple-rose.—Rve. Conch. Icon. Achat. London, 1850; sp. 29.

The colouring of this species is extremely variable; there is, however, but one prevailing idea in its manner of distribution. The columella is of a livid purple-rose in all the varieties.—Reeve.

This is one of the most common shells met with on Oahu, and passes through numerous slight variations, which have led to their description as distinct species. Mr. Gulick, who has very minutely studied cabinet specimens, places the *A. producta* Reeve, as a synonym of this species, and claims that in that gentleman's Monograph he gives *A. varia* Gul. erroneously as the true *vulpina*. Specimens exist in the French collection which passed under the eye of Férussac, and are labelled "*A. vulpina*" which answer to the shells as figured by Reeve. No doubt can exist of the correct references by European authors to this species. The dextral *vulpina* differs greatly from the shell described by Mr. Reeve as *producta*. The figure in Férussac is from one of those unfortunate individuals discolored by the hot bath.—Newc.

Hab. Palolo to Manoa.

The following is the description of MM. Quoy and Gaimard on page 477 and plate 68, figs. 13 and 14 in the Zoology of Voyage .... Uranie et Physicienne, Paris, 1824:—

Testa sinistrorsa, conica, elongata, vertice obtuso; nitida, argute striata; epidermide fulvo vel rufo-fugaci; apice pallido; anfractibus 5 1-2 convexi usculis, suturis distinctis, duplicatis; apertura semi-lunata, alba; peristomate intus incrassato; columella alba vel rosea, arcuata; rima umbilicali lata non distincta. (a) Rufa, unicolore, pl. 68, fig. 13. (b) Rufa, fascia brunea, pl. 68, fig. 14.

56. Achatinella stewarti Green.

Achatina stewarti Green. Contrib. Macl. Lyc. Phila., I, No. 2 (1827, July), p. 47, pl. iv, figs. 1-4.

A. testa sinistrorsa—ovato—oblonga—lutescente, minutissime striata—colore varia, nunc unicolore, nunc divertissime fasciata—columella rosea—glabro tenue—intus albido.—Stewart's Journal, London, 1828, p. 404.

Stewart's Achatina.—Shell heterostrophe—conical—oblong—about one inch in length and half an inch in diameter—whorls six or seven, rounded and marked with numerous oblique and delicate striæ—apex rather obtuse, and not eroded—a deeply impressed line along the upper part of the whorls, parallel with the suture, periostracha smooth and very glossy, colour and markings exceedingly various, the ground colour is usually greenish or some shade of yellow, sometimes a single blackish coloured band accompanies the suture, sometimes this band is doubled and of different shades, and on many specimens there are two bands, one at the suture and one in the middle of the whorls. In some varieties the base of the body whorl is dark brown, the rest of the shell being of a dark form, and not unfrequently the whole shell is without any markings whatever; in which case the colour is yellow, the aperture, when inverted is ear-shaped, the truncation of the columella is rounded and thickened in a remarkable manner at its edge; along the inner margin of the outer lip there is a strong callous ridge, as in most of the species of this genus, which gradually attenuates towards the edge of the lip, which is thin and sharp inside, white and pinkish round the columella. This splendid little Achatina was brought from Oahu, one of the Sandwich Islands, by the Rev. C. S. Stewart.—Green, in Stewart's Journal.

Hab. Manoa and Tantalus.

57. Achatinella varia Gulick.

A. varia Gulick. Ann. Lyc. New York, vol. vi, p. 222, p. vii, fig. 43.

Shell sinistral, imperforate, acuminately oblong, solid, shining, finely striated, white, streaked with brown, with a black line beneath the suture, and green or brown at the base; apex somewhat acute; spire elongately conic; suture margined, lightly impressed; whorls 6, flatly convex; columellar fold central, brown or rose, strong; aperture oblique, truncately auriform, white within; peristome thickened within; external margin unreflected, arcuate; columellar margin dilated, adnate, usually margined with black; parietal margin wanting.

Length 0.85 in. (21 3-5 mill.); breadth 0.41 in. (10 2-5 mill.).

Length of body whorl 0.56 in. (14 mill.).

Length of a large specimen 1.06 in. (27 mill.); breadth 0.51 in. (13 mill.).

Average weight 6.70 grains.

Var. B. White above, green or yellow at the base.

Var. C. Green at the base, white above, with one or more green bands.

Var. D. Green, brown, or yellow at the base, upper whorls radiated with white and brown, and banded with green or yellow.

Var. E. Radiated with white, and reddish brown.

Var. F. White except the suture and columella.

Var. G. Green or yellow; passing to *A. stewarti* Green.

Var. H. Green with one narrow, white, spiral band, passing just above the suture.

Var. I. Yellow with white sutures, and a dark brown band revolving beneath.

Var. J. Chestnut brown at the base, becoming paler towards the apex, with several obscure, spiral, brown lines.

Remarks. The metropolis of the species is Palolo Valley, where it is very abundant. In Waialae and Wailupe, which lie to the east, it gradually becomes more rare, and disappears in Niu, which has furnished me but one specimen of Var. F. In Manoa, on the west, it soon disappears, being found only on the mountain ridge that separates it from Palolo. Dextral specimens are very rare: I have a few from Waialae.

This shell has been described and figured by Reeve as *A. vulpina* Fér., and others have followed him; but a comparison of his figures with Férussac's leads me to doubt his correctness, and after an acquaintance with the species in their native valleys, I do not hesitate to separate them as distinct.

The shell here described corresponds more nearly to what I have placed as Var. C.—Gk.

Hab. Palolo, Waialae and Wailupe.—Gk.

This species is very variable and is closely related to the shells of the *diversa* group.

58. Achatinella tricolor Smith.

A. tricolor Sm. P. Zool. Soc. London, 1873, p. 76; pl. ix, fig. 6.

Testa sinistrorsa, ovato-subconica, imperforata, nitida, incrementi lineis oblique et transversim subtilissime striata, alba, anfractuum medio zona lata flavo-olivacea cincta basimque versus viridi strigata; sutura distincte saturate fusco marginata; anfract. 6 1-2, convexi, primi 2–3 albi vel rubescentes; apertura alba; perist. tenue, intus leviter limbatum; plica columellaris valida, rosacea. Long. 22, diam. 10 1-2 mill.

Var. A. Testa alba, zona unica olivacea medio cincta.

Var. B. Testa flavida, zona latissima castanea subbasali cincta.

Shell sinistral, ovate-subconical, imperforate, shining, obliquely and transversely very finely striated with lines of growth,

white, encircled at the whorls by a broad yellowish olive band and striped towards the base with green; suture distinctly margined with dark brown; whorls 6 1-2, convex, first 2–3 white or reddish; aperture white; lip thin, lightly edged within; columellar fold strong, rosy.

Var. A. Shell white, encircled at the middle by a single olive band.

Var. B. Shell yellow, encircled near the base by a very broad chestnut band.

Hab. Ioleka, in Heia.—Sm.

This is nearly related to *A. varia* Gk.

PRODUCTA GROUP.

59. Achatinella producta Reeve.

A. producta Reeve. Rve. Conch. Icon. Achat., London, 1850, sp. 13.

Shell somewhat elongately conical, dextral, whorls convex, slightly margined at the sutures, columella conspicuously callous-toothed, apex rather small; olive-green, apex, columella, and interior of the aperture white.

Mr. Gulick is quite correct in placing *A. hybrida* and *venulata* as synonyms of this species. The artistic skill of the "late Consul-General of France," as displayed upon these shells, proved quite sufficient to deceive their describer, and lead to a wrong "diagnosis."—Newc.

The animal is strongly granulated above; when young, of a pale flesh, when adult, of a slate color, with the tentacular sheaths of a dark slate.—Newc.

Hab. Manoa to Nuuanu.—Bald. Tantalus.

This is the first named of a group of very common shells found from Manoa Valley to Nuuanu. These shells are very nearly allied to the older *A. vulpina* Fér., and should perhaps more properly be grouped with that species, which is usually found in Palolo. The description of *A. hybrida* Newc. is not given, as it is simply a manufactured variety from *A. producta* Reeve.

60. Achatinella bilineata Reeve.

A. bilineata Reeve. Rve. Conch. Icon. Achat., London, 1850, sp. 22.

Shell oblong-conical, dextral, rather ventricose towards the base, whorls rounded, columella dentately plicate; bright yellow,

conspicuously encircled round the middle with two close black lines.

Hab. Manoa to Nuuanu.

Dr. Cooke says, from a comparison of the types, that this is only a banded form of *A. producta*.

61. Achatinella johnsoni Newcomb.

A. johnsoni Newc. P. Zool. Soc. London, 1853, p. 147, pl. xxiii, fig. 50.

Shell dextral, conically elongate; whorls 7, slightly rounded, superiorly indistinctly margined; suture rather deep; aperture subovate; columella with a strong plication, pink, margined with black; color of shell white or pinkish, banded with two or more narrow black lines, one or two of which are central, one sutural, and one usually broader inferiorly on the last whorl. Long. 18/20, lat. 9/20 poll.

The following form an allied group: *A. producta*, *hybrida*, *aplustre*, *venulata* and *johnsoni*.

Hab. Koolau.—Newc.

Dr. Cooke found the type to be a white shell with dark bands, a banded variety of *A. producta* Reeve. Dr. Newcomb dedicated this species to the Rev. Mr. Johnson of Kauai.

62. Achatinella aplustre Newcomb.

A. aplustre Newc. P. Zool. Soc. London, 1853, p. 147, pl. xxiii, fig. 51.

Shell conical, dextral; whorls 7, rounded; suture moderately impressed, simple; aperture semi-ovate; lip thin, with a callus, terminating in a twisted plait, bluish white tipped with brown; three first spiral turns white, the others with a broad central pink band, margined by two deep black bands; on the last whorl, superiorly and inferiorly, is a broad bright green band. Long. 1, lat. 10/20 poll.

The gaudy coloring of this species alone separates it from the *A. johnsoni* Nob. It belongs to the same sections with *A. producta* Reeve, which may be taken as the type of a group of species numbering some half-a-dozen, and which require still further additions to render it complete.—Newc.

Hab. Koolau.—Newc. Manoa.

Mr. Baldwin places this with *A. johnsoni* Newc., and it is without doubt the same shell, with more of the green color. It

comes very near to forms of *A. trilineata* Gk., found further east. Dr. Cooke considers that the shells from which this species was described were artificially modified from *A. trilineata* or *A. johnsoni*.

63. Achatinella solitaria Newcomb.

A. solitaria Newc. P. Zool. Soc. London, 1853, p. 150, pl. xxiv, fig. 60.

Shell ovately conical, dextral; whorls 6, flatly convex; suture slightly impressed; aperture ovate; lip acute, thickened within; columella white, short, broad and abruptly twisted; colour light chestnut, with darker longitudinal stripes, green at the base; a white sutural band for the last two and one-half whorls, and a brown brown band on the suture above. Long. 14/20, lat. 8 1-2/20 poll.

But a solitary specimen of this species has been obtained. Its characters are, however, sufficiently striking to warrant us in giving it a place as a distinct species.—Newc.

Hab. Palolo.—Newc.

I should place this very near to *A. producta* Reeve. Dr. Cooke found the type specimen was marked similarly to *A. dunkeri* Pfr., which is a variety of *A. producta*.

64. Achatinella venulata Newc.

A. venulata Newc. P. Zool. Soc. London, 1853, p. 146, pl. xxiii, figs. 48, 48*a*.

Shell dextral, elongately conic; whorls 7, convex, slightly margined above; suture well impressed; aperture subovate; lip simple, thickened within; columella strongly plicate, twisted, of a pinkish hue; colour of shell white, or pinkish white, with longitudinal veins of green or olive-green epidermal matter. Long. 21/20, lat. 10/20 poll.

Var. Sinistral, with a deep black sutural band.

Hab. Koolau.—Newc.

This shell is in fact only a form of *A. producta* Rve. It is said to have been a manufactured variety.

65. Achatinella dunkeri Pfeiffer.

A. dunkeri (Cuming, MSS.) Pfr. P. Zool. Soc., London, 1855, p. 208.

A. testa imperforata, oblongo-turrita, solidiuscula, lævigata, pallide carnea, strigis confertis fusculis ornata, lineis 1 vel 2 nigris sæpe cincta; spira turrita, apice acutiuscula, alba; sutura leviter marginata, pallida; anfr. 6 1-2

vix convexiusculis, ultimo 2-5 longitudinis fere æquante; apertura obliqua, truncato-auriformi; plica colum. alba, valida, dentiformi, subsulcata; perist. recto, acuto, pone limbum fusculum albo labiato. Long. 24, diam. 11 mill.

Shell imperforate, oblong-turreted, somewhat solid, smooth, pale flesh-colored, ornamented with close brown stripes, often encircled by one or two black lines; spire turreted, apex somewhat acute, white; suture lightly margined, pale; whorls 6 1-2, scarcely convex, the last almost equal to 2-5 the length; aperture oblique, truncate-auriform; columellar fold white, strong, dentiform, subsulcate; peristome erect, acute, with white lip behind the brown edge.

Hab. Pauoa and Tantalus.

This is a common shell found near Honolulu, and certainly comes very near to *A. producta* Rve. Both sinistral and dextral examples occur.

OLIVACEA GROUP.

66. Achatinella olivacea Reeve.

A. olivacea Rve. Conch. Icon. Achat., London, 1850, sp. 20.

Shell oblong-conical, sinistral, whorls convex, thinly margined round the upper part, columella with a twisted plait; dark green-olive, encircled with rather obscure brownish lines, columella and interior of the aperture white.

Hab. Manoa to Nuuanu.—Bald.

This group is very nearly related to the *producta* group.

67. Achatinella prasinus Reeve.

A. prasinus Rve. Conch. Icon. Achat., London, 1850, sp. 27.

Shell oblong-conical, sinistral, whorls convex, obliquely somewhat rudely impressly striated, columella short, twisted-plaited; very dark green, encircled with obscure dark lines, white at the apex, columella white.

There is a slight peculiarity of form, and a very distinct arrangement of colors in this species.—Newc.

Hab. Nuuanu and Kalihi.

It seems to be one of the dark green forms of *A. olivacea* Rve.

68. Achatinella castanea Reeve.

A. castanea Rve. Conch. Icon. Achat., London, 1850, sp. 24.

Shell oblong-conical, sinistral, rather obtuse at the apex, whorls convex, thinly margined round the upper part, columella

dentately plicate; burnt yellow, lower half of the last whorl bright chestnut, sometimes chestnut throughout, columella and interior of the aperture white.

Hab. Makiki to Nuuanu.

A great many color varieties are found, from almost jet-black to rich bright chestnut, with and without bands. The author's collection contains a very extensive series of these beautifully colored shells.

69. Achatinella adusta Reeve.

A. adusta Rve. Conch. Icon. Achat., London, 1850, sp. 30.

Shell acuminately oblong, somewhat turreted, sinistral, whorls rounded, columella short, callous, toothed; dark chestnut, darker toward the base, with a spiral black band beneath the sutures, columella pinkish.

Hab. Makiki to Nuuanu.

This is only a variety of *A. castanea* Rve. It is distinguished by a black sutural band.

70. Achatinella ernestina Baldwin.

A. ernestina Bald. P. Acad. Phil., 1895, p. 217, pl. x, figs. 5, 6.

Shell sinistral, subperforate, moderately solid, ovately conical; apex subacute; surface shining, obliquely striated with delicate growth lines, under a strong lens exhibiting numerous, very close, and minute decussating striæ; apical whorls smooth, scarcely decussated. Color yellow, lighter above; variously striped with transverse, dark chestnut bands, the more constant being one bordering the suture, one at the periphery, spiral above, and one encircling the base. Whorls 6, narrowly margined above, somewhat convex; suture moderately impressed. Aperture oblique, oval, faintly exhibiting the dark bands of the exterior; peristome acute, somewhat thickened within, slightly expanded, white, the coloring of the exterior bands appearing on the inner edge; columella white, terminating in a prominent, oblique, tortuous fold.

Length 21, diam. 12 mm.

The animal, when extended in motion, as long as the shell. Mantle light brown, sprinkled with black and margined on the outer edge with an interrupted reddish-yellow line. Superior portion of foot light brown, thickly studded with small slate spots; under portion of foot light brown with a slate tinge. Tentacles dark slate.

This species is found near the mountain ridge separating the habitats of *A. castanea* Rve. and *A. fuscolineata* Sm.; and in general appearance and characters it is intermediate between these

species. It is much smaller than the former and rather larger than the latter, and differs from them both in the arrangement of the colors. Transition forms between it and both of them are numerous. An item of specific value is the difference in the exterior appearance and color of the animals.—Bald.

Hab. Nuuanu Valley.—Bald.

This shell forms a connecting link between this group and the *colorata* group.

BELLULA GROUP.

71. Achatinella bellula Smith.

A. bellula Sm. P. Zool. Soc. London, 1873, p. 77, pl. ix., fig. 8.

Testa dextrorsa, elongato-subconica, imperforata, nitida, incrementi lineis levissime striata, dilute castanea (spira pallidiore) saturatius strigata lineisque paucis subcastaneis obsoletis et zona fere nigra (interdum deficiente) infra peripheriam cincta; anfract. 6 1-2, parum convexi; sutura leviter castaneo marginata; apertura brevis, longitudinis 2-5 æquans, intus alba; perist. margine tenue, intus leviter incrassatum; plica columellaris subvalida, purpurea. Long. 20, diam. 10 mill.

Shell dextral, elongate-subconic, imperforate, shining, very lightly striated with lines of growth, light chestnut (spire paler) more darkly striped and surrounded by a few obsolete chestnut-like lines and an almost black band (sometimes absent) below the periphery; whorls 6 1-2, hardly convex; suture lightly margined with chestnut; aperture short, equal to 2-5 the length, white within; margin of the lip thin, lightly thickened within; columellar fold quite strong, purplish.

Hab. Pauoa and Nuuanu.

A great variety of color markings are found in this species, among which are the following:

Var. A. Reddish brown, without bands or lines.

Var. B. White with one black band on the last whorl.

Var. C. Pure white.

Var. E. A yellowish-white shell with several black bands, approaching *A. multizonata* Bald.

Var. F. Yellowish color with no bands.

Var. G. Shell white with brown bands.

72. Achatinella ligata Smith.

A. ligata Sm. P. Zool. Soc. London, 1873, p. 76, pl. ix, figs. 12, 13.

Testa dextrorsa (vel sinistrorsa) elongato-ovato-subconica, mediocriter nitida, incrementi lineis transversimque minutissime striata, albida, luteo-olivaceo plusve minusve strigata, zonis plerumque duabus pallido-fuscis

cincta altera supra altera peripheriam infra; anfract. 5 1-2, convexiusculi; sutura distincte marginata, saturate fusco ligata; apertura alba; perist. intus leviter limbatum; plica columellaris valida, rosea. Long. 19, diam. 10 mill.

Var. A. Testa elongatior. Long. 21, diam. 9 mill.

Var. B. Testa alba, in anfr. ult. zonis angustis pluribus flavis cincta.

Shell dextral (or sinistral) elongate-ovate-subconic, moderately shining, transversely and minutely striated with lines of growth, whitish, more or less striped with yellowish-olive and often encircled by two pale-brown bands, the one above, the other below the periphery; whorls 5 1-2, somewhat convex; suture distinctly margined, wound with dark brown; aperture white, lightly edged within; columellar fold strong, rose.

Var. A. Shell more elongate.

Var. B. Shell white, encircled on the last whorl by many narrow yellow bands.

Affinities. It has somewhat the aspect of dextral forms of *A. varia* Gk., but is more elongate and cylindrical.—Sm.

Hab. Reported from Waimalu.—Sm. Nuuanu to Halawa.

The light striped forms of *A. bellula* Sm. seem to come very near to this shell. Named from the dark brown sutural band.

73. Achatinella multizonata Baldwin.

A. multizonata Bald. P. Acad. Phil., 1895, p. 215, pl. x, figs. 1, 2.

Shell dextral, imperforate, moderately solid, elongately conical, apex sub acute, surface shining, striated with fine lines of growth, under a strong lens showing very numerous, extremely minute decussating striæ; apical whorls smooth, scarcely decussated; color white, variously striped with numerous dark brown lines and bands, some on the base and others spiral. Whorls 6, lightly marginate above, convex; suture lightly impressed; aperture oblique, oval, white, the dark bands of the exterior visible within; peristome acute, thickened within, slightly expanded, white, the dark lines of the exterior marked on the inner edge; columella purplish brown, terminating in a strong, oblique, tortuous fold. Length 18, diam. 10 mm.

Animal when extended in motion, longer than the shell. Mantle brown, lighter on the outer edge. Foot above and below light brown; posterior portion tapering. Tentacles long and slender; these, with the head above, slate color.

A great variety of transition forms occur between this species and *A. bellula* Sm., which is found on the neighboring mountain ridges of Nuuanu Valley, and is a much larger shell. The animals of the two extremes are specifically different. The mantle of

the latter is black, whereas that of the former is brown, and that of the intermediate forms varies from black to brown.

Hab. Nuuanu Valley.—Bald.

Dr. Cooke, in his paper on the Distribution and Variation of A. multizonata from Nuuanu Valley, has divided this shell into twenty-five color-varieties, using the letters A–T and V–Z. He goes on to say that:

"These color-varieties fall naturally into seven groups. The first of these groups, and also the largest, is made up of the color-varieties A–H. It is easily recognized, as none of the shells are marked with dark bands or lines. The shells vary from white to yellow. The apex is white to light brown; never striped. The columella is usually white, sometimes purple. This group represents about 37 per cent. of *A. multizonata*. Of this group 63 per cent. were found on lehua, about 16 per cent. on Straussia, and 17 per cent. on guava.

"The second of these groups contains the color-varieties I–M. The shells are white to yellow, sometimes marked with brown. All the shells of this group are encircled at the periphery by a dark brown band, or two brown lines. The apex in every case is white or light brown. The columella is usually purple, almost never white. This group is only found from sub-ridges I–XIV. It contains nearly 19 per cent. of the specimens of *A. multizonata*. Of this group 53 per cent. were found upon lehua, 15 per cent. on Straussia, and 24 per cent. on guava; 48 per cent. of this group were found on subridges IX–XIII.

"The third of these groups contains the color-variety N. This color-variety is so distinct from all the other color-varieties that it is thought best to place it in a group by itself. All the specimens came from sub-ridges III–V, 62 per cent. coming from sub-ridge IV. About 40 per cent. were found on lehua, 21 per cent. on Straussia, and 27 per cent. on guava.

"The fourth group contains the color-varieties O–Q. This group is distributed over nearly the whole range of the species. It is absent, however, from sub-ridges IX–XI. The shells of this group are striped with from four to fifteen lines or bands. The apex is striped with a light brown band. The columella is usually purple; in only a very few cases is the columella white. Of this group 48 per cent. came from sub-ridge XIV; 44 per cent. were found on lehua, 12 per cent. on Straussia, and 43 per cent on guava.

"The fifth group is made up of color-varieties R–T. The shell is white, variously striped; the apex is white; columella is usually purple. About 60 per cent. were found on lehua, 15 per cent. on Straussia, and 19 per cent. on guava. This group is dis-

tributed over nearly the whole range of the species; only five specimens were found below sub-ridge XIV.

"The sixth group is made up of the color-varieties V–Y. The shells are variously colored from a rich mahogany brown to a pinkish purple. The apex is usually banded; in some cases it is white. The columella is usually purple. All except two specimens came from sub-ridges XV–XVII; 75 per cent. were found upon lehua. This group comes nearest, in color, to *A. bellula* Sm., but differs in form and size from that species.

"The seventh group is made up of the color-variety Z. This color-variety agrees with several of the other color-varieties in the markings of the lower whorls, but differs from them in the very dark banded apex. Of this group 96 per cent. were found on sub-ridges I and II; 70 per cent. were found on guava, and 23 per cent. on lehua."

COLORATA GROUP.

74. **Achatinella colorata** Reeve.

A. colorata Rve. Conch. Icon. Achat., London, 1850, sp. 18.

Shell oblong-conical, dextral, whorls flatly convex, columella with a twisted plait, aperture small; yellow, encircled with a very broad green band, sutures black-brown, columella light pink.

Hab. Ahuimanu.—Hartman. Kalihi.—Bald.

This and the following nine species may be well grouped together as the *colorata* group. All are found in the valleys between Nuuanu and Halawa.

75. **Achatinella ampla** Newc.

A. ampla Newc. P. Zool. Soc. London, 1853, p. 137, pl. xxii, fig. 19.

Shell dextral, conically-ovate, polished; whorls 5, rounded; suture simple, banded with a black stripe; aperture large and white; outer lip simple, acute, thickened within; columella short, white or roseate, terminating in a twisted plait; apex obtuse, roseate; epidermis light green or olive above, of a deeper colour on the last whorl. Long. 14/20, lat. 10/20 poll.

Hab. Koolau.—Newc.

Baldwin calls this a large variety of *A. colorata* Rve. It looks to me very much like *A. adusta* Rve., but both *colorata* and *adusta* are sinistral, while this is dextral.

76. Achatinella cuneus Pfeiffer.

A. cuneus Pfr. P. Zool. Soc. London, 1855, p. 205.

A. testa imperf., sinistr., oblongo-turrita, solida, striatula, nitida, albida vel lutescente, fasciis angustis fuscis varie ornata; spira convexo-conica, apice alba, acutiuscula; sutura filo castaneo marginata; anfr. 6, planiusculis, ultimo 1-3 longitudinis paulo superante; apertura fere diagonali, semiovali, intus alba; plica colum. mediocri, oblique subtorta; perist. acuto, intus labiato, margine columellari adnato. Long. 18, diam. 8 mill.

Shell imperforate, sinistral, oblong-turreted, solid, somewhat striated, shining, whitish or yellowish, variously ornamented with narrow brown bands; spire convex-conic, apex white, somewhat acute; suture margined with a chestnut line; whorls 6, somewhat plane, with the last a little more than 1-3 the length; aperture almost diagonal, semioval, white within; columellar fold small, obliquely twisted; lip acute, thickened within, adnate to the margin of the columella.

Hab. Kalihi to Moanalua.—Bald.

77. Achatinella diluta Smith.

A. diluta Sm. P. Zool. Soc. London, 1873, p. 74, pl. ix, fig. 14.

Testa dextrorsa, ovato-subconica, nitida, incrementi lineis transversimque indistincte minutissime striata, dilute luteo-virens, lineis pluribus transversis viridibus obscuris cincta; sutura leviter marginata; anfract. 5 1-2, convexiusculi; apertura alba; perist. tenue, intus leviter incrassatum; plica columellaris valida, alba. Long. 18, diam. 9 mill.

Shell dextral, ovate-subconic, shining, transversely and indistinctly minutely striated with lines of growth, light yellowish-green, encircled by many transverse obscure green lines; suture lightly margined; whorls 5 1-2, somewhat convex; aperture white; lip thin, slightly thickened within; columellar fold strong, white.

Hab. Kalihi.

78. Achatinella cucumis Gulick.

A. cucumis Gk. Ann. Lyc. New York, 1856, vol. vi, p. 225, pl. vii, fig. 45.

Shell sinistral, imperforate, acuminately oblong, solid, shining, striated, green; apex rather obtuse; spire turreted; suture margined, impressed; whorls 6, convex; columellar fold central, white, moderately developed; aperture oblique, sinuately oval, white within; peristome thickened within; with external margin unreflected, arcuate, acute; columellar margin dilated, adnate; parietal margin wanting.

Length 0.74 in. (19 mill.), breadth 0.38 in. (9 2-3 mill.).

Length of body whorl 0.50 in. (13 mill.).

Average weight 5.20 grains.

Var. B. Of a burnt yellow color.

Var. C. With one or more obscure brownish spiral lines.

Remarks. The shell figured in var. B is the most attractive in coloring though not the most abundant.

Hab. Kalihi.—Gk.

79. Achatinella virens Gulick.

A. virens Gk. Ann. Lyc. New York, 1858, vol. vi, p. 254, pl. viii, fig. 73.

Shell sinistral, imperforate, ovate-conic, solid, shining, striate, green or yellowish; apex subacute, yellowish white; spire convexly conic; suture margined, chestnut, moderately impressed; whorls 6, convex; columellar fold central, strong, rose or sometimes white; aperture oblique, truncately auriform, white within; peristome thickened within, acute; with external margin unreflected, arcuate; columellar margin dilated, adnate; parietal margin wanting.

Length 0.75 in. (19 mill.), breadth 0.40 in. (10 mill.).

Length of body whorl 0/50 in. (13 mill.).

Weight 5.20 grains.

Station. On the Lama, Hao, Ohia (*Eugenia malaccensis*), and Kukui (*Aleurites triloba*).

Remarks. This species completes the gradation between *A. stewarti* Green and *A. colorata* Rve.—Gk.

Hab. Halawa and Nuuanu.—Gk.

80. Achatinella fuscolineata Smith.

A. fuscolineata Sm. P. Zool. Soc. London, 1873, p. 75, pl. ix, figs. 2, 2a.

Testa sinistrorsa, ovato-conica, imperforata, nitida, incrementi lineis oblique et transversim subtilissime striata, virenti-flava, viridi strigata, lineis (3–5) fuscis peripheriam supra cincta; sutura distincte fusco marginata; anfract. 6 1-2, convexi, primi 3 albi; apertura alba; perist. album (interdum fuscum), margine acuto intus limbatum; plica columellaris valida, rosea (interdum alba). Long. 19, diam. 10 mill.

Var. A. Testa virenteor.

Var. B. Testa minor, subtestacea, dilute castaneo strigata transversimque saturate fusco superne zonata.

Shell sinistral, ovate-conic, imperforate, shining, obliquely and transversely minutely striated with lines of growth, greenish yellow, striped with green, encircled above periphery with (3–5) brown lines; suture distinctly margined with brown; whorls 6 1-2, convex, first 3 white; aperture white; lip white (sometimes brown),

with margin acute edged within; columellar fold strong, rose sometimes white.

Var. A. Shell greener.

Var. B. Shell smaller, subtestaceous, striped with pale chestnut and transversely banded above with dark brown.

Hab. The typical form of this species is found in Kailua, in Oahu; but varieties which are constantly classed with it are found in nearly all the valleys between Palolo and Halawa.—Smith.

Dr. Cooke found the type to agree with shells from Moanalua; the body whorl is yellow.

81. Achatinella consanguinea Smith.

A. consanguinea Sm. P. Zool. Soc. London, 1873, p. 73, pl. ix, fig. 3.

Testa sinistrorsa (inderdum dextrorsa), imperforata, nitida, incrementi lineis oblique et transversim (sub lente) subtilissime striata, olivaceo virenti-cinereoque varie strigata; anfract. ultimi dimidium inferius castaneum coloribus præcedentibus strigatum; sutura distincte saturate fusco marginata; anfract. 6 1-2, convexi, primi 3 1-2 rubescentes; apertura alba; perist. intus fusco tinctum, alboque limbatum; plica columellaris valida, rosacea. Long. 18, diam. 10 mill.

Var. Testa spiraliter olivaceo obscure zonata.

Shell sinistral (sometimes dextral), imperforate, shining, obliquely and transversely (microscopically) very minutely striated with lines of growth, variously striped with olive green-gray; the lower half of the last whorl chestnut striped with the preceding colors; suture distinctly margined with dark brown; whorls 6 1-2, convex, the first 3 1-2 reddish; aperture white; lip colored with brown within, and edged with white; columellar fold strong, rosy.

Var. Shell indistinctly spirally banded with olive.

Hab. Ahuimanu.—Sm.

82. Achatinella analoga Gulick.

A. analoga Gk. Ann. Lyc. New York, 1856, vol. vi, p. 227, pl. vii, fig. 47.

Shell sinistral, imperforate, oblong-conic, solid, shining, finely striated, green, yellow, or white, with three black spiral bands, one sutural, one entering the aperture the other revolving above the suture; apex obtuse; spire turreted; suture margined, moderately impressed; whorls 6, convex; columellar fold central, brown or white, moderately developed; aperture oblique, sinuately oval, white within; peristome thickened within; with external margin unreflected, arcuate, acute; columellar margin dilated, adnate; edged with brown; parietal margin wanting.

Length 0.72 in. (18 1-3 mill.), breadth 0.37 in. (7 2-5 mill.).
Length of body whorl 0.48 in. (12 mill.).
Average weight 4.80 grains.

Var. A. Yellowish white.

Var. B. Brown yellow.

Var. C. Green.

Var. D. Green or yellow at the base, and white above.

Var. E. With but one or two black bands.

Var. F. With four or five black bands.

Remarks. Inhabits ravines near the centre of the main mountain ridge of Oahu, and is allied to *A. colorata* Rve. and *A. cuneus* Pfr., from that region, but represents, in its bands and general style of coloring, *A. trilineata* Nob., one of the group of larger shells found in the more eastern valleys. I have before me one dextral specimen.—Gk.

Hab. Halawa.—Gk.

83. Achatinella longispira Smith.

A. longispira Sm. P. Zool. Soc. London, 1873, p. 73, pl. ix, fig. 5.

Testa sinistrorsa, elongato-subconica, imperforata, nitida, incrementi lineis et transversim subtilissime striata, flava, zonis angustis spiralibus (4–6) viridibus fuscisque promiscue ornata; sutura distincte saturate fusco marginata; anfr. 6 1-2, convexi, primi 3 1-2 albidi; apertura longitudinis 2-5 æquans, alba; perist. margine acuto intus limbatum; plica columellaris valida, rosacea. Long. 21, diam. 10 mill.

Var. A. Testa brevior, ovato-conica. Long. 18, diam. 10 mill.

Var. B. Testa flava, zonis modo viridibus ornata.

Shell sinistral, elongate-subconic, imperforate, shining, transversely very finely striated with lines of growth, yellow, promiscuously ornamented with (4–6) narrow spiral green and brown bands; suture distinctly margined with dark brown; whorls 6 1-2, convex, first 3 1-2 whitish; aperture equal to 2-5 of the length, white; lip with margin acute, edged within; columellar fold strong, rosy.

Var. A. Shell shorter, ovate-conic.

Var. B. Shell yellow, ornamented with green bands.

This species is most nearly allied to *A. analoga* Gk., which is readily distinguished from this by the two black lines upon the periphery of the whorl. The black or dark brown lines of that species belong to the solid substance of the shell, while the green and yellow bands of this species belong to the epidermis.—Sm.

Hab. Halawa.—Sm. Moanalua to Halawa.

CASTA GROUP.

84. Achatinella casta Newcomb.

A. casta Newc. P. Zool. Soc. London, 1853, p. 134, pl. xxii, fig. 12.

Shell conically elongate, solid, polished, shining, dextral or sinistral; whorls 6, rounded, margined above; aperture subovate, rather small; lip simple, thickened within; columella short, with a strong plaited brownish tooth; colour white or yellow, with extremely variable transverse bands of black, brown, pink or white, variously arranged. Long. 13/20, lat. 6 1-2/20 poll.

This species is readily distinguished from any yet described. Its northern limit is the valley below Mouna Rua [*sic*], and half a dozen ravines, south, in the District of Ewa.—Newc.

Hab. Ewa.—Newc. Halawa to Waipio.

85. Achatinella pygmæa Smith.

A. pygmæa Sm. P. Zool. Soc. London, 1873, p. 75, pl. ix, fig. 11.

Testa sinistrorsa, ovato-conica, nitida, incrementi lineis transversimque exilissime striata, flavescens; sutura leviter marginata; anfract. 5 1-2, convexi, primi 3 1-2 albi; apertura alba; perist. leviter limbatum; plica columellaris mediocriter magna, rosea. Long. 14, diam. 8 mill.

Var. Testa albida, linea supra zonaque brunnea peripheriam infra cincta.

Shell sinistral, ovately conic, shining, transversely very finely striated with lines of growth, light yellow; suture lightly margined; whorls 5 1-2, convex, first 3 1-2 white; aperture white; lip lightly edged; columellar fold moderately large, rose.

Var. Shell whitish, encircled above the periphery by a brown line and below by a brown band.

Affinities. It is somewhat allied to *A. casta* Newc., but is much smaller and heavier in proportion to its size.—Sm.

Hab. Waipio.—Sm.

86. Achatinella concolor Smith.

A. concolor Sm. P. Zool. Soc. London, 1873, p. 75, pl. ix, fig. 1.

Testa sinistrorsa, ovato-conica, nitida, incrementi lineis et transversim (anfract. primis 3 modo) striata, flava (dilute brunneo interdum strigata); sutura distincte marginata; anfract. 6, convexi, primi 3 albidi; apertura alba; perist. tenue; plica columellaris valida, rosea. Long. 19, diam. 10 mill.

Shell sinistral, ovate-conic, shining, transversely striated on the first 3 whorls only with lines of growth, yellow (sometimes striped with pale brown); suture distinctly margined; whorls 6,

convex, first 3 whitish; aperture white; lip thin; columellar fold strong, rose.

Hab. Ewa.—Frick. Halawa.

87. Achatinella juddii Baldwin.

A. juddii Bald. P. Ac. Phila., 1895, p. 216, pl. x, figs. 3, 4.

Shell dextral, imperforate, solid, pyramidally conical, apex obtuse; surface shining, covered with very delicate incremental lines; the nuclear whorls smooth. Color light gray, shading into light chestnut on the apical whorls, the gray more intense under the cuticle; with two black lines, one below and one at the periphery, the latter faint and continued on the spire; between the lines a white band which revolves on the suture to the very tip of the apex. Whorls 6, margined above, slightly convex; suture lightly impressed. Aperture oblique, oval, white, the light gray of the exterior surface exhibiting a darker shade within; peristome acute, slightly thickened within, a little expanded, columellar margin very slightly reflected, white, the coloring of the exterior dark lines reappearing rather more intense on the inner edge; columella white, terminating in a moderately developed flexuous fold. Length 15, diam. 9 1-2 mm.

No opportunity for an examination of the animal has yet occurred. The shell is typically very distinct from any other known species. The light chestnut band on the apical whorls is a characteristic and invariable feature. The basal portion of the shell sometimes has a yellowish hue. In immature shells the colors are more intense.

Named in honor of Hon. A. F. Judd, Chief Justice of the Republic of Hawaii, by whose son the shell was discovered.—Bald.

Hab. Halawa.—Bald.

88. Achatinella papyracea Gulick.

A. papyracea Gk. Ann. Lyc. New York, vol. vi, 1856, p. 229, pl. vii, fig. 48.

Shell sinistral, imperforate, ovate-conic, thin, polished, finely striated, light grey, or of leaden ash color, with obscure, brown spiral lines; apex subacute; spire convexly conical; suture marginate, impressed; whorls 5 1-2, moderately convex; columellar fold central, usually white, slightly developed, and not strongly twisted; aperture oblique, sinuately oval, white or gray within; peristome scarcely thickened, with external margin unreflected, arcuate, acute; columellar margin narrow, adnate; parietal margin wanting.

Length 0.65 in. (16 1-2 mill.), breadth 0.38 in. (9 2-3 mill.). Length of body whorl 0.48 in. (12 mill.).

Of a large specimen, length 0.74 in. (19 mill.); breadth 0.41 in. (10 2-5 mill.); length of body whorl 0.53 in. (13 1-2 mill.).

Average weight 2.50 grains.

Var. B. Without the brown lines.

Station. On the Hala (*Pandanus odoratissimus*) and other trees.

Remarks. A thin, papyraceous shell, a few specimens of which I had the good fortune to obtain from a native girl of the mountain, who regretted the time spent in gathering them, as several had been crushed among her heavier shells.—Gk.

Hab. Kalaikoa, Ahonui and Wahiawa.—Gk.

89. Achatinella juncea Gulick.

A. juncea Gk. Ann. Lyc. New York, vol. vi, 1856, p. 230, pl. vii, fig. 49.

Shell sinistral, imperforate, elongately and acuminately ovate, thin, shining, finely striated, snow white; apex somewhat acute; spire convexly turreted; suture margined, well impressed; whorls 6, convex; columella white, with a light twisted fold near the body whorl; aperture oblique, oval, white within; peristome moderately thickened; with external margin slightly expanded anteriorly, arcuate, acute; columellar margin narrow, adnate; parietal margin very thin.

Length 0.65 in. (16 1-2 mill.), breadth 0.30 in. (7 3-5 mill.).

Length of body whorl 0.44 in. (11 1-5 mill.).

Weight 1.50 grains.

Var. B. With two or three brown spiral bands.

Station. On the Ahakea.

Remarks. A neat, delicate species, nearly allied to *A. papyracea* Nob., but sufficiently characterized as a distinct species.—Gk.

Hab. Kalaikoa, Wahiawa and Helemano.—Gk.

This is somewhat related to the *casta* group.

90. Achatinella lehuiensis Smith.

A. lehuiensis Sm. P. Zool. Soc. London, 1873, p. 76, pl. ix, fig. 4.

Testa sinistrorsa, ovato-conica, subnitida, incrementi lineis transversimque exilissime striata, alba, zona purpureo-fusco strigata, et zonis duabus fuscis altera supra altera peripheriam infra (et interdum aliis) cincta; sutura submarginata; anfract. 5 1-2, convexi; apertura alba; perist. tenue; plica columellaris valida, rosea. Long. 17, diam. 10 mill.

Shell sinistral, ovate-conic, scarcely shining, and transversely very feebly striated with lines of growth, white, having a band striped with purple-brown, and encircled by two (and sometimes

more) brown bands, the one above, the other below the periphery; suture submarginate; whorls 5 1-2, convex; aperture white; lip thin; columellar fold strong, rose.

Hab. Lihue.—Sm.

PULCHERRIMA GROUP.

91. Achatinella pulcherrima Swainson.

A. pulcherrima Swain. Zool. Ill., iii, 1833, p. 123, pl. 3, fig. 2.

A. testa ovato oblonga, sub-cylindracea, alba vel flava, fasciis castaneis ornatis; labii margine fusco.

Var. A. Aurantia, sutura castanea.

Shell ovate oblong, subcylindrical, white or yellow, with broad bands of chestnut; margin of the lip brown.

Var. A. Golden yellow, suture chestnut.

This very elegant species is about eight-tenths of an inch long, and is much more slender than any of the preceding. It varies somewhat in form, some specimens being more ventricose than others, and also in the number and colour of its bands. The ground colour is a deep and rich chestnut, with from one to three bands of orange, yellow, fulvous, or white: the marginal groove to the suture is very close and distinct in all. The golden yellow variety is without bands: in all the colours are remarkablly rich and vivid.—Swain.

Hab. Wahiawa to Kawailoa.—Gk.

The *pulcherrima* group includes a large variety of shells of various colors from almost pure white to very dark brown, with and without bands. All are dextral. *A. byronii* Wood, comes very near to this group, but I have not been able to secure the description of that shell.

92. Achatinella melanostoma Newcomb.

A. melanostoma Newc. P. Zool. Soc. London, 1853, p. 132, pl. xxii, fig. 7.

Shell dextral, polished, solid, conical; whorls 6, plano-convex, slightly margined above; suture moderate, accompanied by a black revolving band; aperture subovate; lip black, thickened within; columella short, brownish red, terminating abruptly in a strong plait or tuberosity; colour yellowish or umber, with or without transverse brown lines. Long. 14/20, lat. 7/20 poll.

Hab. Ewa.—Newc. Waipio to Wahiawa.

The very black lip marks this member of the *pulcherrima* group.

93. Achatinella limbata Gulick.

A. limbata Gk. Ann. Lyc. New York, vol. vi, 1858, p. 252, pl. viii, fig. 70.

Shell dextral, imperforate, conic, solid, shining, striate, sometimes rugose, green or yellow; apex rose, frequently faded in mature specimens; spire conic, suture margined, black, moderately impressed; whorls 6, convex; the last subangulated; columellar fold central, white, strong; aperture rather rectangularly auriform, white within; peristome black, slightly thickened within; with external margin dilated, adnate; parietal margin wanting.

Length 0.76 in. (19 1-3 mill.), breadth 0.44 in. (11 1-5 mill.).

Length of body whorl 0.50 in. (13 mill.).

Average weight 6.70 grains.

Station. On the Pua, Ahakea, Hao, Naupaka (*Scævola chamissoiana*), and Ohia (*Eugenia malaccensis*).

Remarks. It differs from *A. melanostoma* Newc. in being more rugose, with rose colored apex and subangulated body whorl.—Gk.

Hab. Ahonui and Kalaikoa.—Gk.

94. Achatinella recta Newcomb.

A. recta Newc. P. Zool. Soc. London, 1853, p. 145, pl. xxiii, fig. 45.

Shell usually dextral, solid, pyramidal; whorls 6, but slightly rounded, margined above; suture slightly impressed; aperture subovate; lip simple, thickened within; columella short, twisting to unite with the inner lip; colour various, usually yellow, plain, or with two black bands on the last whorl, one of which is lost in the aperture, the other becomes sutural. Long. 14/20, lat. 7/20 poll.

The shell above described is peculiar for its solidity and rigid aspect. It possesses none of the graceful curves which give to this genus so much of its beauty. The largest size yet discovered is given in the measurement.—Newc.

Hab. Waialua.—Newc.

The shell is generally white or whitish yellow on the body whorl, and is marked by a narrow brown band just above the suture.

95. Achatinella nympha Gulick.

A. nympha Gk. Ann. Lyc. New York, vol. vi, 1858, p. 251, pl. viii, fig. 69.

Shell dextral, imperforate, oblong-ovate, solid, shining, very lightly striated, yellow or chestnut, sometimes lined with brown; apex subacute; spire convexly conic; suture narrowly margined, moderately impressed; whorls 6, somewhat convex; columellar fold central, white, strong; aperture truncately auriform, white within; peristome white, strongly labiate; with external margin

scarcely reflected, arcuate; columellar margin dilated, adnate; parietal margin wanting.

Length 0.73 in. (18 1-2 mill.), breadth 0.40 in. (10 mill.).
Length of body whorl 0.50 in. (13 mill.).
Average weight 6.30 grains.

Station on the leaves of the Naupaka (*Scævola chamissoiana*) and other trees.

Remarks. Helemano is the metropolis of the species, but it is sometimes found in the other valleys above mentioned.—Gk.

Hab. Ahonui, Wahiawa, Helemano, Kawailoa, and Waimea.—Gk.

This species includes the very light forms of the *pulcherrima* group.

96. Achatinella mahogani Gulick.

A. mahogani Gulick. Ann. Lyc. New York, vol. vi, 1858, p. 254, pl. viii, fig. 72.

Shell dextral, imperforate, turreted, solid, shining, striate, reddish chestnut; apex obtuse, rose; spire concavely turreted; suture lightly margined, moderately impressed; whorls 6, convex; the last inflated, with the base black chestnut and regularly rounded; columellar fold central, white, strong; aperture truncately auriform, white within; peristome margined with brown, thickened within; with external margin scarcely reflected anteriorly, arcuate; columellar margin dilated, adnate; parietal margin wanting.

Length 0.81 in. (20 3-5 mill.), breadth 0.43 in. (11 mill.).
Length of body whorl 0.48 in. (12 mill.).
Average weight 8.00 grains.

Remarks. It lacks the black color of lip and suture which characterizes *A. melanostoma* Newc. and *A. limbata* Nob., and also differs in the general form and color.—Gk.

Hab. Ahonui and Kalaikoa.—Gk.

This includes the very dark chestnut forms.

LIVIDA GROUP (CURTA GROUP).

97. Achatinella livida Swainson.

A. livida Swain. Zool. Ill., 1832, pl. cviii, fig. 2.

A. testa sinistrorsa, ovata, obtusa, livide-fusca; spira incrassata, sutura fulva.

Shell reversed, ovate, obtuse, livid brown, spire thickened, suture fulvous.

A small, unbanded species, scarcely exceeding half an inch long, and perfectly resembling, in form, the green variety of *bulimus citrinus*. The three specimens, now before me, are reversed; varying from a light olive brown, to a livid purplish colour, which lies in longitudinal shades, and gradually changes to white on the terminal whorls of the spire; the suture is marked by a narrow band of deep fulvous: aperture white, tinged with purple.—Swain.

Dr. Newcomb very correctly unites *A. livida* Swains., *A. emersonii* Newc. and *A. glauca* Gul. He says: "I am sorry to be obliged to place so many synonyms under this species. The very short description and unsatisfactory figure given by Swainson, have doubtless contributed to this result. A complete series to connect the extremes of these varieties will demonstrate the necessity of making at least a dozen more species, or to include them all under one. Mr. Gulick is mistaken in supposing that the variety figured by Mr. Reeve is not found on the island of Oahu. This and all the other varieties are met with in the District of Waialua, and it is an interesting fact, that all the species described by Mr. Swainson are from the same district."

Hab. Waialua.—Bald.

In the type shell, of *A. livida* Swains., Dr. Cooke found the first three whorls white, the fourth and fifth whorl greenish gray, suture brown, lip dark, and columella white. This group of short shells is often called the Curta group.

98. Achatinella curta Newcomb.

A. curta Newc. P. Zool. Soc. London, 1853, p. 144, pl. xxiii, fig. 43.

Shell conical, sinistral, polished; whorls 5, rounded, margined above, the last very ventricose; aperture ovate; lip simple, slightly thickened within; columella short, with an abrupt callous termination; suture but slightly impressed; colour yellow or chestnut, plain or with a black sutural band, rarely with two or more on the last two whorls; columella white or light brown. Long. 12/20, lat. 8/20 poll.

The rounded whorls and obese appearance of this shell are strikingly characteristic. It is a rare species and extremely limited in its range.—Newc.

Hab. Waialua.—Newc.

The *curta* or *livida* group includes a number of shells of much the same size, but having a great variety of colors. They all come from the district near Helemano and Waialua.

99. Achatinella emmersonii Newcomb.

A. emmersonii Newc. P. Zool. Soc. London, 1853, p. 156, pl. xxiv, fig. 74.

Shell conical, polished, dextral, rather solid; whorls 6, rounded; margined above; suture distinct; aperture subovate; columella short, tuberculate; lip acute, margined with black within; aperture internally pure white; exterior of shell uniform pearly white. Long. 11/20, lat. 8/20 poll.

This shell in its general aspect is the complete counterpart of *A. mighelsiana* of Pfeiffer. The latter species is from Molokai. This is clearly distinct, as may be seen from a cursory examination of the two species.—Newc.

Hab. District of Waialua.—Newc.

Dr. Cooke found the type shell to be a light variety of *A. livida* Swains.

100. Achatinella undulata Newcomb.

A. undulata Newc. P. Boston Soc., vol. v, 1855, p. 218.

Shell sinistral or dextral, rather solid, acutely conical, shining, polished; with longitudinal oblique fine striæ; microscopically spirally striate; whorls 6, rounded and marginal above; suture well impressed; aperture sub-ovate; columella short and plicately twisted; lip acute, thickened within. Color light olive alternating with slightly undulating chestnut lines and bands, rarely marked by transverse black fasciæ; columella and aperture white. Long. 12/20, lat. 6/20 poll.

Remarks. This species, very variable in color and size, has in all cases the undulating markings by which it acquires its name. The specimen illustrated varies in the latitude from that given above by 2/20 in., and is more obese in consequence.—Newc.

Hab. Waialua.—Newc.

101. Achatinella glauca Gulick.

A. glauca Gk. Ann. Lyc. New York, vol. vi, 1858, p. 232, pl. viii, fig. 51.

Shell sinistral, rarely dextral, imperforate, acuminately ovate, solid, shining, striated, fawn or lead colored, with two black bands, one entering the aperture; apex somewhat acute, white; spire conic, with slightly convex outlines; suture marginate, moderately impressed; whorls 6, convex; columellar fold central, white or pale pink, moderately developed; aperture sinuately oval, white within; peristome thickened within; with external margin un-

reflected, arcuate, acute, bordered with brown; columellar margin dilated, adnate; parietal margin wanting.

Length 0.66 in. (17 mill.), breadth 0.36 in. (9 mill.).

Length of body whorl 0.44 in. (11 1-5 mill.).

Average weight 3.90 grains.

Var. B. With a third brown sutural line.

Var. C. With one black spiral band passing above the suture.

Var. D. With a white band encircling the base between the two black bands; very rare.

Remarks. This species bears the same relation to *A. livida* Swains., that *A. recta* Newc. bears to *A. curta* Newc.—Gk.

Hab. Kawailoa.—Gk.

102. Achatinella contracta Gulick.

A. contracta Gk. Ann. Lyc. New York, vol. vi, 1858, p. 239, pl. viii, fig. 59.

Shell sinistral, imperforate, broadly conic, solid, shining, striated, ash or fawn colored, with two black bands, one sutural, the other revolving just above the suture on the spire, and encircling the base near the periphery of the body whorl; apex somewhat acute, white with brown suture; spire regularly conic; suture marginate, moderately impressed; whorls 5 1-2, slightly convex; the last large; columellar fold central, white, strong; aperture truncately auriform, white within; peristome thickened within; with external margin unreflected, arcuate, subacute; columellar margin dilated, adnate; parietal margin wanting.

Length 0.53 in. (13 1-2 mill.), breadth 0.36 in. (9 mill.).

Length of body whorl 0.39 in. (10 mill.).

Average weight 4.00 grains.

Remarks. The sutural band is sometimes wanting, and some specimens have another band entering the aperture. I have but one specimen from Hauula, which is of the latter mentioned variety, and rather larger than those from Kaawa.

It is allied to *A. zonata* Nob. and *A. undulata* Newc.—Gk.

Hab. Kaaawa.—J. S. Emerson. Hauula.—Gk.

103. Achatinella delta Gulick.

A. delta Gk. Ann. Lyc. New York, vol. vi, 1858, p. 231, pl. viii, fig. 50.

Shell sinistral, imperforate, conic, obliquely truncated at the base, solid, shining, striated, yellow at the base, paler above, with two or three ash-brown bands; apex rather obtuse, white; spire conic; suture marginate, lightly impressed; whorls 5 1-2, slightly

convex; columellar fold central, white, strong; aperture truncately auriform, white within; peristome thickened within; with external margin unreflected, arcuate, acute; columellar margin dilated, adnate, white; parietal margin wanting.

Length 0.63 in. (16 mill.), breadth 0.42 in. (10 2-3 mill.).

Length of body whorl 0.46 in. (11 2-3 mill.).

Average weight 4.70 grains.

Var. B. Without bands.

Var. C. With one black spiral line.

Var. D. With two broad black bands.

Remarks. In Wahiawa, which is the metropolis of the species, var. A is the most abundant; var. B is more widely diffused, being occasionally found in each of the above mentioned localities; vars. C and D are very rare; the former approaches *A. contracta* Nob., and the latter passes into an unusual variety of *A. emersonii* Newc. The most nearly allied species is *A. curta* Newc., which is readily distinguished by its peculiar marking and smaller size.—Gk.

Hab. Kalaikoa, Ahonui, Wahiawa and Helemano.—Gk.

104. Achatinella rhodorhaphe Smith.

A. rhodorhaphe Sm. P. Zool. Soc. London, 1873, p. 74, pl. ix, fig. 10.

Testa sinistrorsa, breviter ovato-conica, imperforata, nitida, incrementi lineis et transversim (sublente) exilissime striata, flava, suturam infra zona lata dilute rosea cincta; anfract. 6, convexi, primi 3 albi; sutura distincte marginata; apertura alba; perist. margine acuto intus limbatum; plica columellaris valida, rosea (interdum alba). Long. 15, diam. 8 1-2 mill.

Var. Testa flava, suturam infra castaneo zonata.

Shell sinistral, shortly ovate-conic, imperforate, shining, transversely (microscopically) very feebly striated with lines of growth, yellow, encircled below the suture by a broad pale rose band; whorls 6, convex, first 3 white; suture distinctly margined; aperture white; lip with margin acute, edged within; columellar fold strong, rose (sometimes white).

Var. Shell yellow, encircled below the suture with chestnut.

Hab. Helemano and Kawailoa.—Gk.

105. Achatinella herbacea Gulick.

A. herbacea Gk. Ann. Lyc. New York, vol. vi, 1858, p. 233, pl. viii, fig. 52.

Shell sinistral, sometimes dextral, imperforate, ovate-conic, solid, shining, striated, of a dull color; apex rather obtuse, white; spire conic, suture marginate, moderately impressed; whorls 6, convex; columellar fold central, white, strong; aperture truncately

auriform, white within; peristome slightly thickened within; with external margin unreflected, arcuate, acute; columellar margin dilated, adnate; parietal margin very thin.

Length 0.71 in. (18 mill.), breadth 0.41 in. (10 2-5 mill.).

Length of body whorl 0.50 in. (13 mill.).

Average weight 4.40 grains.

Var. B. With a black sutural band; columellar fold usually white, sometimes lilac.

Var. C. Yellow, with smoother surface, approaching *A. recta* Newc.

Station. On the trees of the Pua, Ahakea, and Ohawai (*Lobelia grimesiana*).

Remarks. Dr. Newcomb has placed this with *A. curta* Newc., but I consider it quite distinct. About a fifth of my specimens are dextral.—Gk.

Hab. In the forest between the streams of Waimea and Kawailoa.—Gk.

This shell seems to connect this group with the *albescens* group of shells found near Waimea and Kahuku.

ALBESCENS GROUP.

106. Achatinella albescens Gulick.

A. albescens Newc. Ann. Lyc. New York, vol. vi, 1858, p. 237, pl. viii, fig. 57.

Shell sinistral, sometimes dextral, imperforate, ovate-conic-solid, shining, striated, white or sometimes yellowish; apex some, what acute; spire convexly conical; suture marginate, well impressed; whorls 6, somewhat swollen beneath the suture, and slightly flattened in the middle; columellar fold central, white, strong; aperture truncately auriform, white within; peristome thickened within; with external margin unreflected, slightly arcuate; columellar margin dilated, adnate; parietal margin wanting.

Length 0.70 in. (18 mill.), breadth 0.42 in. (10 2-3 mill.).

Length of body whorl 0.51 in. (13 mill.).

Average weight 4.60 grains.

Station. On the leaves of the Pua, Ahakea, and Lama.

Remarks. Nearly a third of the specimens from Waimea and Pupukea are dextral, but in Waialee, the metropolis of the species, they are always sinistral.—Gk.

Hab. Waimea, Pupukea, Waialee, Kahuku, and Hauula. —Gk.

Many of the shells of this group are closely related to some of the shells of the *livida* or *curta* group. They are all found farther west, and as a rule are more slender in shape.

107. Achatinella zonata Gulick.

A. zonata Gk. Ann. Lyc. New York, vol. vi, 1858, p. 237, pl. viii, fig. 58.

Shell sinistral, sometimes dextral, imperforate, ovate-conic, solid, shining, striated, white or yellowish, with a brown sutural band, and two black bands, one entering the aperture; apex somewhat acute; spire conical, with outlines slightly convex; suture marginate, moderately impressed; whorls 6, convex; the last regularly rounded; columellar fold central, rose or white, moderately developed; aperture semiorbicular, white within; peristome slightly thickened within; with external margin unreflected, arcuate, acute; columellar margin dilated, adnate; parietal margin wanting.

Length 0.65 in. (16 1-2 mill.), breadth 0.40 in. (10 mill.).

Length of body whorl 0.49 in. (12 2-5 mill.).

Average weight 4.60 grains.

Remarks. The dextral specimens are for the most part found in Waimea and Pupukea.—Gk.

Hab. Waimea, Pupukea, Waialee, Kahuku, and Hauula. —Gk. Kaaawa.—J. S. Emerson.

108. Achatinella dimorpha Gulick.

A. dimorpha Gk. Ann. Lyc. New York, vol. vi, 1858, p. 236, pl. viii, fig. 56.

Shell sinistral, sometimes dextral, imperforate, turreted, solid, shining, striated, white or yellow, with a brown sutural band; apex rather obtuse; spire turreted; suture marginate, moderately impressed; dark brown; whorls 6, convex; columellar fold central, white or rose, moderately developed; aperture truncately ellipsoidal, white within; peristome slightly thickened within; with external margin unreflected, arcuate, acute; columellar margin dilated, adnate; parietal margin wanting.

Length 0.70 in. (18 mill.), breadth 0.37 in. (9 2-5 mill.).

Length of body whorl 0.45 in. (11 2-5 mill.).

Average weight 4.00 grains.

Station. On the leaves of the Pua, Ahakea, and other trees.

Remarks. This and *A. zonata* Nob., which inhabit the same valleys, correspond to *A. curta* and *A. recta* Newc., which are similarly associated in the valleys of Waialua, an adjoining district of the same island.—Gk.

Hab. Waimea, Pupukea, Waialee, and Kahuku.—Gk.

109. Achatinella cognata Gulick.

A. cognata Gk. Ann. Lyc. New York, vol. vi, 1858, p. 240, pl. viii, fig. 60.

Shell sinistral, imperforate, ovate, conic, solid, shining, striated, of pale rosy fawn color, with a brown sutural band; apex subacute; spire convexly conic; suture marginate, brown, lightly impressed; whorls 6, slightly convex; columellar fold central, rose-colored, strong; aperture truncately auriform, within white lightly tinged with rose; peristome thickened within; with external margin unreflected, arcuate, acute; columellar margin dilated, adnate; parietal margin wanting.

Length 0.75 in. (19 mill.), breadth 0.40 in. (10 mill.).

Length of body whorl 0.53 in. (13 1-2 mill.).

Average weight 5.60 grains.

Var. B. White.

Var. C. Pale green.

Remarks. Allied to *A. dimorpha* Nob.—Gk.

Hab. Hakipuu.—Gk. Waikane.—Frick.

110. Achatinella scitula Gulick.

A. scitula Gk. Ann. Lyc. New York, vol. vi, 1858, p. 241, pl. viii, fig. 61.

Shell sinistral, imperforate, elongately ovate, solid, shining, striated, streaked with brown and pale fawn; apex subacute; spire convexly elongate; suture marginate, moderately impressed; whorls 6 1-2, convex; columella with a moderately developed white fold near the body whorl; aperture sinuately ellipsoidal, white within; peristome well thickened within; with external margin unreflected, slightly compressed in the middle, with the anterior edge arcuate; columellar margin dilated, adnate; parietal margin wanting.

Length 0.82 in. (21 mill.), breadth 0.42 in. (10 2-3 mill.).

Length of body whorl, 0.53 in. (13 1-2 mill.).

Average weight 4.80 grains.

Remarks. There is a green variety which passes into var. C of the last described species. But in that species the suture and columella are dark, while in this they are light colored.—Gk.

Hab. Hakipuu.—Gk.

Mr. Sykes places this with *A. decipiens* Newc., a shell generally, but perhaps incorrectly, placed in Section Bulimella. It may be related to that shell. The *decipiens* group is very hard to place with certainty.

111. Achatinella formosa Gulick.

A. formosa Gk. Ann. Lyc. New York, vol. vi, 1858, p. 235, pl. viii, fig. 55.

Shell sinistral, imperforate, acuminately ovate, solid, shining, striated, white, with two black bands, one entering the aperture, sometimes with the upper part of the whorl of a pale slate color; apex somewhat acute; spire convexly conic; suture marginate, well impressed; whorls 6 1-2, convex; columellar fold central, white, strong; aperture truncately auriform, white within; peristome thickened within; with external margin unreflected, arcuate, acute; with columellar margin dilated, adnate; parietal margin wanting.

Length 0.80 in. (20 1-3 mill.), breadth 0.42 in. (10 2-3 mill.).

Length of body whorl 0.55 in. (14 mill.).

Average weight 6.00 grains.

Var. B. With the two bands uniting in one broad black belt.

Var. C. With numerous black spiral lines.

Station. On the Ki (*Cordyline terminalis*) and other leaves.

Remarks. A rare species, and of great interest on account of its affinities, which connect it with species so different from each other. *A. glauca*, *delta*, *phæozona*, and *zonata* are certainly not very similar; but this species seems to connect itself directly with varieties of each of these species.—Gk.

Hab. Waimea.—Gk.

112. Achatinella cæsia Gulick.

A. cæsia Gk. Ann. Lyc. New York, vol. vi, 1858, p. 234, pl. viii, fig. 53.

Shell sinistral, imperforate, ovate-conic, solid, shining, striated, so streaked with white and fawn as to have a grey appearance; apex somewhat acute; spire convexly conic; suture marginate, moderately impressed; whorls 6 1-2, convex; columellar fold central, white, moderately developed; aperture sinuately oval, white within; peristome thickened within; with external margin unreflected, arcuate, acute, edged with brown; columellar margin dilated, adnate; parietal margin wanting.

Length 0.72 in. (18 1-3 mill.), breadth 0.42 in. (10 2-3 mill.).

Length of body whorl, 0.50 in. (13 mill.).

Average weight 4.00 grains.

Remarks. This with *A. concidens* and *A. formosa* Nob., which are found in Waimea, correspond to *A. undulata* Newc., *A. emersonii* Newc., *A. glauca* Nob. found in Kawailoa.—Gk.

Hab. Waimea.—Gk.

113. Achatinella concidens Gulick.

A. concidens Gk. Ann. Lyc. New York, vol. vi, 1858, p. 234, pl. viii, fig. 54.

Shell sinistral, imperforate, ovate-conic, solid, shining, striated, brown banded with white; apex somewhat acute; spire convexly conic; suture marginate, white, moderately impressed; whorls 6 1-2, convex; columellar fold central, white, moderately developed; aperture truncately oval, white within; peristome thickened within; with external margin unreflected, arcuate; columellar margin dilated, adnate; parietal margin wanting.

Length 0.79 in. (20 mill.), breadth 0.43 in. (11 mill.).

Length of body whorl 0.55 in. (14 mill.).

Average weight 4.75 grains.

Remarks. My specimens of this species are more or less bleached and faded. Continued search was made for living specimens, but without success.—Gk.

Hab. Waimea.—Gk.

Corresponds to *A. emersonii* Newc. of Kawailoa.

III.

Section **BULIMELLA** Pfeiffer.

Beginning with the Southeastern end of Oahu.

VIRIDANS GROUP.

114. Achatinella viridans Mighels.

A. viridans Migh. P. Boston Soc., ii, 1845, p. 20.

Shell dextral, elongate-conic, green, with light streaks intermixed, imperforate; whorls five, convex, with a revolving, slightly impressed line below the suture; aperture subovate, stained with a pink color just within the margin; lip slightly thickened. L. 3-4, diam. 7-15 inch.

Animal light grey; tentacles and tentacular sheath dark slate; mantle thick, yellowish brown; tentacles strongly clubbed, short and robust, when extended, longer than the shell.—Newc.

Hab. Nuuanu to Waialae.

115. Achatinella subvirens Newcomb.

A. subvirens Newc. P. Zool. Soc. London, 1853, p. 136, pl. xxii, fig. 18.

Shell conically ovate; whorls 6, rounded and margined above; suture distinct and lined with white; aperture ovate, expanding below; lip thickened; columella short, flat and obliquely truncated; colour of epidermis light green, interspersed with a lighter shade arranged longitudinally; columella, lip and aperture white. Long. 15/20, lat. 7/20 poll.

Var. A. Pure white.

Var. B. Brown or chestnut replacing the green colour.

Through var. A this species approaches a variety of *A. rutila*, and through var. B, *A. decipiens*. It is readily distinguished from the first by its smaller size, greater solidity, stronger striæ and more

elongate form; from the latter by its less acuminate form, white suture, less solidity and their widely separated localities.—Newc.

Hab. Niu.—Newc.

116. Achatinella rutila Newcomb.

A. rutila Newc. P. Zool. Soc. London, 1853, p. 138, pl. xxii, fig. 21.

Shell ovately conic; whorls 6, rounded, the last margined above; suture well marked; aperture subquadrate; lip expanded, subreflected, strongly thickened within; columella short, terminating in a strong twisted plait; colour a light straw, olive or brown. Long. 17/20, lat. 9/20 poll.

Animal small in proportion to the shell, of a uniform yellowish white, retractile part of upper tentacles of a light brown; tentacles filaform and slightly clubbed; foot very broad, long as the shell; mantle same colour as animal.—Newc.

It will be seen by comparing the animal of this species with that of *A. viridans*, that they are clearly distinct; and Dr. Pfeiffer, by taking an extreme variety of this species for his *A. macrostoma*, thus gives evidence in its favor. This last named is in the collection of Mr. Cumming.—Newc.

Hab. Niu.—Newc.

117. Achatinella tæniolata Pfeiffer.

A. tæniolata Pfr. P. Zool. Soc. London, 1846, p. 38.

Ach. testa ovato-oblonga, solida, striatula, nitida, alba, fasciis variis fuscis, deorsum obsoletioribus ornata; spira conica, acutiuscula; anfractibus 6 convexiusculis, ultimo 4-9 longitudinis subaquante; columella alba, superne valide dentato-plicata; apertura irregulariter semiovali, intus alba, nitida; peristomate extus brevissime incrassato, intus valde labiato, margine columellari dilatato, reflexo, appresso. Long. 20, diam. medio 11 mill.

Shell ovate-oblong, solid, somewhat striated, shining, white, ornamented with various brown bands, more obsolete below; spire conic, somewhat acute; whorls 6, somewhat convex, the last nearly equal to 4-9 of the length; columella white, strongly dentate-plicate above; aperture irregularly semioval, white within, shining; lip very shortly incrassate without, strongly thickened within, dilated at the margin of the columella, reflexed, appressed.

Hab. Palolo and Niu.—Bald. Waialae.

This and the following, although showing distinct characteristics, can be grouped with *A. viridans* Migh., found near by.

118. Achatinella rubiginosa Newcomb.

A. rubiginosa Newc. P. Zool. Soc. London, 1853, p. 154, pl. xxiv, fig. 69.

Shell dextral, solid, ovately conical; whorls 6, rounded, margined above; suture well impressed; lip lightly subreflected, thickened within; aperture ovate; columella short, strongly dentate, with an expanded callus covering the umbilicus; colour a bright reddish brown, with a white band accompanying the sutures; columella and lower and outer portion of last whorl white. Long. 15/20, lat. 8/20 poll.

This species passes into the white variety of *A. tæniolata* of Pfeiffer; but in the latter species the mantle of the animal is of a dark slate-colour, and in the present species it is of a light flesh-colour. The marking is characteristic of the species, the rusty hue varying in intensity and quantity of surface covered in different specimens.—Newc.

I defer to the opinion of Dr. Pfeiffer in placing *A. rubiginosa* as a synonym of his *A. tæniolata*. The form of the shells is nearly identical, and although differing in marking, the principal ground of separation originally was a difference in the animals. The dark chestnut shell is furnished with a light, and even the immaculate variety of *tæniolata* with a brown-colored mantle.—Newc.

Hab. Palolo.—Newc.

Dr. Cooke found this shell to be simply the brown variety of *A. tæniolata* Pfr.

ABBREVIATA GROUP.

119. Achatinella abbreviata Reeve.

A. abbreviata Rve. Rve. Conch. Icon. Achat., London, 1850, sp. 19.

Shell ovate, somewhat ventricose, dextral, whorls convex, margined round the upper part, spire rather short, obtuse at the apex, columella callous, twisted; olive-yellow, with a black-brown line at the sutures, lower part of the last whorl very dark green, apex black.

Animal light grey, covered with numerous granulations of a dark slate; mantle, a dirty yellow; tentacles but slightly clubbed; when extended, nearly as long as the shell.

A. nivosa is this shell fully developed, with the epidermis removed so skilfully as to escape detection at the time it was described.—Newc.

Hab. Palolo.

120. Achatinella nivosa Newcomb.

A. nivosa Newc. P. Zool. Soc. London, 1853, p. 132, pl. xxii, fig. 6.

Shell dextral, conical; whorls 6, rounded, margined above; suture moderate; aperture subovate; columella short, twisted into a flexuous plate inferiorly; lip simple; apex of shell obtuse; colour above brownish, below pure white, ornamented with beautiful longitudinal green or brownish interrupted stripes, with or without one or more pink colored or brown transverse bands; columella pink or white. Long. 14/20, lat. 8/20 poll.

This beautiful species belongs to the same group with *A. abbreviata* and *A. bacca*.

Hab. Niu.—Newc.

This description is given here, although Dr. Newcomb afterwards admitted it to be only a manufactured variety from *A. abbreviata* Rve.

121. Achatinella bacca Reeve.

A. bacca Rve. Rve. Conch. Icon. Achat., London, 1850, sp. 45.

Shell abbreviately conical, dextral, rather ventricose, whorls convex, margined round the upper part, columella plicately twisted; very dark chestnut, sutures yellowish, columella pinkish.

Animal of a greenish slate above, tentacles and sheath dark brown, mantle yellowish green; length, when extended, equal to the shell.—Newc.

Hab. Palolo.

This is the dark, sometimes almost black variety of *A. abbreviata* Rve.

SOWERBYANA GROUP.

122. Achatinella sowerbyana Pfeiffer.

A. sowerbyana Pfr. P. Zool. Soc. London, 1855, p. 4, pl. xxx, fig 14.

A. testa sinistrorsa, imperforata, conico-oblonga, solidula, sublævigata, glutinoso-nitente, fulvo-lutescente, saturatius subradiata; spira convexiusculo-conica, subacuta; sutura marginata; anfr. 6, vix convexiusculis, ultimo spira paulo breviore, basi saccato-rotundato; apertura obliqua, obauriformi, intus alba; plica columellari supera, valida, torta, rosea; perist. roseo-labiato, margine externo breviter expanso, columellari dilatato, adnato. Long. 18, diam. 9 mill.

B. Paulo minor, flavo-albida, basi castanea vel viridula.

Shell sinistral, imperforate, conic-oblong, somewhat solid, quite smooth, glutinous-shining, tawny-golden yellow, more darkly radiated; spire somewhat convex-conic, subacute; suture marginate; whorls 6, hardly convex, the last a little shorter than the spire, base saccate-rotundate; aperture oblique, obauriform, white within; columella fold high, strong, twisted, rose; lip thickened, rose, outer margin slightly expanded, columellar margin dilated, adnate.

B. Slightly smaller, yellow-white, chestnut or greenish at the base.

Hab. Nuuanu and Kalihi.

Dr. Cooke found the type of this shell to have the first and second whorls white, third, fourth and fifth whorls yellowish, suture of a slightly darker yellow than the ground color, lip and columellar plait pink. The figure looks much like a shell now known as *A. lyonsiana* Bald.

123. Achatinella fuscobasis Smith.

Bulimella fuscobasis Sm. P. Zool. Soc. London, 1873, p. 77, pl. ix, fig. 15.

Testa ovata, sinistrorsa, nitida, alba, anfract. ultimis flavescens, zona mediana basique fuscis ornatus; anfract. 6, convexiusculi; sutura distincte marginata; apertura alba; perist. crassum, fuscum; plica columellaris valida. Long. 16, diam. 10 mill.

Shell ovate, sinistral, shining, white, last whorl yellowish, ornamented with a brown band at the periphery and a brown base; whorls 6, somewhat convex, suture distinctly margined; aperture white; lip thickened, brown; columellar fold strong.

Hab. High up on Mount Kaala on the Mokuleia side, on the island of Oahu.—Sm.

There may be a mistake as to the habitat. I have never found a shell anything like this from the Waianae mountains. The description and figure agree exactly with *A. luteostoma* Bald., banded variety, a shell found high up on Mt. Olympus, the ridge back of Manoa and Palolo valleys. Shell named because of its beautiful brown band.

124. Achatinella lyonsiana Baldwin.

A. lyonsiana Bald. P. Acad. Phil., 1895, p. 218, pl. x, figs. 9-11.

Shell sinistral, imperforate, solid, ovate; spire convexly conical, apex obtuse; surface shining, striated with delicate growth lines; apical whorls smooth. Color white, with two reddish-brown

bands, one encircling the base, the other passing around the periphery and revolving on the spire just above the suture; the two bands are sometimes confluent, and often the shell is uniform white, without bands. Whorls 6, narrowly margined above, somewhat convex; suture moderately impressed. Aperture oblique, white within, sinuately oval; peristome white, rather obtuse, thickened within, basal and columellar margins slightly expanded, extremities united by a very thin callus; columella terminating in a strong, tortuous white fold. Length 17, diam. 11 1-2 mm.

Animal. Mantle black, sometimes mottled with white, margined with a narrow line of lighter shade. Superior and under portion of foot light brown. Tentacles, tentacular sheath, and front above very dark brown.

This distinct species is dedicated to Prof. A. B. Lyons, of Oahu College, who has done much to stimulate the study of the Hawaiian land fauna.—Bald.

Hab. Konahuanui Mt., at an altitude of about 3000 feet above sea level.—Bald.

This may prove to be closely related to *A. sowerbyana* Pfr. found on the Kalihi ridges.

125. Achatinella luteostoma Baldwin.

A. luteostoma Bald. P. Acad. Phil., 1895, p. 217, pl. x, figs. 7, 8.

Shell sinistral, imperforate, solid, ovate, spire convexly conical, apex obtuse; surface shining, marked with fine growth lines, under a strong lens seen to be decussated by close, extremely minute spiral striæ, apical whorls smooth. Color white, with a reddish-yellow lip. Whorls 5 1-2, margined above, slightly convex. Suture moderately impressed. Aperture oblique, sinuately oval, white within. Lip obtuse, thickened within, columellar margin very slightly reflexed, extremities united by a very thin yellowish callus. Columella reddish-yellow, terminating in a strong tortuous fold. Length 15 1-2, diam. 9 1-2 mm.

It is *Bulimella rosea* Swains., *var.* Hartman, Proceedings Academy of Natural Sciences of Philadelphia, Jan. 31, 1888, p. 30.

In occasional examples the basal portion below the periphery is light brown, and sometimes a bright chestnut spiral band encircles the periphery.

Dr. Hartman in his valuable Synonymic Catalogue of Achatinella, has noted this species as a small variety of *A. rosea* Swains. When we sent him the shell we were unacquainted with the animal. This proves very different from that of *A. rosea;* and further, the habitat of the two species are separated by a forty mile range of

wild mountain ridges and valleys which do not contain any species intermediate or connecting the two.—Bald.

Hab. Palolo to Niu.—Bald. High up on the ridge.

Related to *A. lyonsiana* Bald., but always smaller.

126. Achatinella hanleyana Pfeiffer.

A. hanleyana Pfr. P. Zool. Soc. London, 1855, p. 202.

A. testa subrimata, dextrorsa, globoso-conica, solida, lævigata (sublente exilissime spiraliter striata), nitida, fulva, castaneo-radiata; spira conica, apice minuto, corneo; sutura filo crenulato marginata; anfr. 6, superis planis, sequentibus modice convexis, ultimo spiram fere æquante, rotundato; apertura obliqua, truncato-auriformi, intus alba; plica colum. supera, valida, dentiformi; perist. intus labiato, margine dextro breviter reflexo, columellari dilatato, calloso, subadnato. Long. 18, diam. 11 mill.

Shell subrimate, dextral, globose-conic, solid, smooth (under a lens very minutely spirally striated), shining, tawny, radiated with chestnut; spire conic, apex minute, horn color; suture margined with a crenulate thread; whorls 6, the upper flat, the following moderately convex, the last almost equal to the spire, rotundate; aperture oblique, truncate-auriform, white within; columellar fold high, strong, dentiform; lip thickened within, the dextral margin slightly expanded, columella margin dilated, calloused, subadnate.

Hab. ?

It is a question just where this shell should be placed. Sykes places it with the Section Apex, while Baldwin places it with the Section Bulimella.

RUGOSA GROUP.

127. Achatinella rugosa Newcomb.

A. rugosa Newc. P. Zool. Soc. London, 1853, p. 138, pl. xxii, figs. 22, 22*a*.

Shell dextral, conical, glossy; whorls 6, rounded, margined above; suture well impressed; lip expanded, of a reddish brown at the margin, thickened near the edge; columella white, short, twisted, and with a strong callus spread over the umbilicus; aperture subrhomboidal; striæ longitudinal, numerous, and on the last whorl rugose; colour of epidermis of a deep green, a light or dark umber, sometimes alternating and arranged with the striæ with or without pale green transverse lines. Long. 14/20, diam. 8/20 poll.

Hab. Ewa.—Newc. Waipio.

This may be classed with the following *A. decipiens* and similar shells, which are found on the other side of the island of Oahu, just over the high mountain ridge. I agree, however, with Sykes, "that this may prove to be only a roughened form of *A. byronii* Wood." This and the following rather elongate shells might better be placed in Section Achatinellastrum rather than here, but I have not as yet made the change.

128. Achatinella decipiens Newcomb.

A. decipiens Newc. P. Zool. Soc. London, 1853, p. 153, pl. xxiv, fig. 68.

Shell conically elongate, solid; whorls 6, slightly rounded, margined above; aperture elongately ovate; lip subreflected; columella short, obliquely twisted, with an expanded callus; suture slightly impressed; striæ numerous, longitudinal, oblique; colour white with yellow transvere bands, or yellow with white transverse lines, and longitudinal chestnut-coloured stripes. Long. 16/20, lat. 7/20 poll.

This species cannot be confounded with any other than the *A. subvirens* in one of its varieties, the distinctive marks of which are given under that species.—Newc.

Hab. Kahana.—Newc.

This seems quite distinct from *A. subvirens*, its habitat is on the other side of the island, and with the three following shells forms a natural group. They are so elongate that they might well be considered as belonging to Section Achatinellastrum. At this point it is difficult to draw the line between the two sections.

129. Achatinella multicolor Pfeiffer.

A. multicolor Pfr. P. Zool. Soc. London, 1855, p. 4, pl. xxx, fig. 11.

A. testa imperforata, dextrorsa vel sinistrorsa, conico-oblonga, solida, striata et sublente minutissime decussata, nitida, lutea vel albida, fasciis nigro-castaneis varie ornata, rarius unicolore; spira elongato-conica, apice subattenuata, acutiuscula; sutura marginata; anfr. 6, planiusculis, ultimo 2-5 longitudinis subæquante, basi rotundato; apertura obliqua, truncato-obauriformi; plica columellari supera valida, torta; perist. nigro-limbato, margine externo substricto, breviter expanso, columellari dilatato, subadnato. Long. 17, diam. 9 mill.

Shell imperforate, dextral or sinistral, conic-oblong, solid, striate, and under the lens very minutely decussate, shining, yellow or white variously ornamented with black-chestnut bands, rarely unicolored; spire elongate-conic, apex subattenuate, somewhat acute; suture margined; whorls 6, quite flat, the last nearly

equal to 2-5 of the length, base rotundate ; aperture oblique, truncate-obauriform ; columellar fold high, strong, twisted ; lip edged with black, outer margin contracted, slightly expanded, columellar margin dilated, subadnate.

Hab. Kahana.

130. Achatinella corrugata Gulick.

A. corrugata Gk. Ann. Lyc. New York, 1858, vi, p. 248, pl. viii, fig. 66.

Shell dextral, imperforate, ovate, solid, shining, striated, green; apex subacute, pale ; spire convexly conic ; suture margined, moderately impressed ; whorls 5 1-2, convex ; the last rugose ; columellar fold central, white, strong ; aperture truncately auriform, white within ; peristome thickened within, white, sometimes margined with brown ; with external margin scarcely reflected anteriorly; columellar margin dilated, adnate ; parietal margin wanting.

Length 0.72 in. (18 1-3 mill.), breadth 0.40 in. (10 mill.).

Length of body whorl 0.50 in. (13 mill.).

Average weight 5.30 grains.

Remarks. The color is often nearly black, and sometimes reddish yellow.

It has been placed by Dr. Newcomb with his *A. decipiens*, but is more nearly allied to *A. rugosa* Newc. From the latter it differs in its usually white lip, and the more convex outlines of its spire. The color also fades gradually towards the apex, instead of terminating abruptly in white, as in *A. rugosa*. Sinistral specimens have been found.—Gk.

Hab. Hakipu.—Gk.

131. Achatinella torrida Gulick.

A. torrida Gk. Ann. Lyc. New York, 1858, vi. p. 250, pl. viii, fig. 68.

Shell sinistral, imperforate, ovate-conic, solid, shining, somewhat rugose, green or fulvous ; apex subacute, chestnut ; spire conic ; suture lightly margined, white, moderately impressed ; whorls 6, convex ; columella with a strong white fold near the body whorl ; aperture oblique, truncately auriform, white within ; peristome white, thickened within ; with external margin scarcely reflected anteriorly, slightly compressed ; columellar margin dilated, adnate ; parietal margin wanting.

Length 0.68 in. (17 1-3 mill.), breadth 0.38 in. (9 2-3 mill.).

Length of body whorl 0.48 in. (12 mill.).

Average weight 4.50 grains.

Var. B. With black spiral lines.

Remarks. I am in doubt concerning the limits of variation of this species. Var. β may be distinct.—Gk.

Hab. Kahana, Kaaawa, and Waikane.—Gk. Waiolu.—J. S. Emerson.

Mr. Baldwin rightly classes this as the sinistral form of *A. corrugata* Gk.

OVATA GROUP.

132. Achatinella ovata Newcomb.

A. ovata Newc. P. Zool. Soc. London, 1853, p. 130, pl. xxii, fig. 2, 2*a*.

Shell dextral or sinistral, elongately ovate; whorls 6, slightly margined above, rounded; suture moderately impressed; aperture subovate, entirely margined with black; columella short, plicate, strong and twisted; lip thickened and slightly expanded; colour of shell pure white or yellowish white, with or without obsolete brownish bands above. Long. 18/20, lat. 10/20 poll.

A very beautiful species, distinguished by its glossy black lip contrasting finely with the white of the shell.—Newc.

Hab. Kahana.—Newc.

This and all of the following Kahana shells may be grouped together.

133. Achatinella candida Pfeiffer.

A. candida Pfr. P. Zool. Soc. London, 1855, p. 2, pl. xxx, fig. 4.

A. testa dextrorsa, imperforata, ovato-conica, striatula, parum nitida, candida; spira convexo-conica, vertice minuto, nigro, acutiusculo; sutura levi, filomarginata; anfr. 6 1-2, planiusculis, ultimo 3-7–4-9 longitudinis æquante, obsolete angulato, basi rotundato; apertura obliqua, truncato-auriformi; plica columellari mediocri, supera, obliqua, subcompressa; perist. fusco-violaceo, intus valide labiato, margine dextro expanso, columellari dilatato, plano, crasso, adnato. Long. 22, diam. 11 mill.

Shell dextral, imperforate, ovate-conic, slightly striate, hardly shining, white; spire convex-conic, tip minute, black, somewhat acute; suture slight, narrowly margined; whorls 6 1-2, somewhat flat, last equal to 3-7–4-9 of the length, scarcely angulated, base rotundate; aperture oblique, truncate-auriform; columellar fold moderate, high, oblique, subcompressed; lip brown-violet, strongly thickened within, dextral margin expanded, columellar margin dilated, flat, thickened, adnate.

Hab. Kahana.

This is the white variety of *A. ovata* Newc.

134. Achatinella fricki Pfeiffer.

A. fricki Pfr. P. Zool. Soc. London, 1855, p. 3, pl. xxx, fig. 7.

A. testa subimperforata, dextrorsa, vel sinistrorsa, oblongo-ovata, solida, leviter striata, nitida, coloribus pervaria; spira convexiusculo-conica, acuta; sutura anguste marginata; anfr. 6, vix convexiusculis, ultimo 3-7 longitudinis subæquante, basi rotundato; apertura obliqua, obauriformi; plica columellari superâ, torta, valida; perist. expansiusculo, obtuso, violaceo vel nigro labiato et limbato, margine dextro substricto. Long. 20–21, diam. 10 1-2 mill.

Shell subimperforate, dextral or sinistral, oblong-ovate, solid, lightly striate, shining, variously colored; spire somewhat convex-conic, acute; suture narrowly margined; whorls 6, hardly convex, the last nearly equal to 3-7 of the length, base rotundate; aperture oblique, obauriform; columellar fold high, twisted, strong; lip somewhat expanded, obtuse, lipped and edged with violet or black, dextral margin contracted.

Hab. Kahana.

Mr. Baldwin places this with *A. ovata* Newc.

135. Achatinella faba Pfeiffer.

A. (Bulimella) faba Pfr. P. Zool. Soc. London, 1859, p. 30.

T. imperforata, dextrorsa, ovata, solidula, irregulariter striata, nitida, alba; spira convexo-conica, apice acutiuscula; sutura simplex; anfr. 5, convexiusculi, ultimus spira paulo longior, rotundatus; plica columellaris supera, valida, nodiformis; apertura parum obliqua, obauriformis; perist. intus crasse labiatum, margine dextro breviter expanso, columellari reflexo, adnato. Long. 16, diam. 10 1-2 mill.

Shell imperforate, dextral; ovate, somewhat solid, irregularly striated, shining, white; spire convex-conic, apex somewhat acute; suture simple; whorls 5, somewhat convex, last a little longer than the spire, rotundate; columellar fold high, strong, nodiform; aperture hardly oblique, obauriform; lip thickly edged within, dextral margin shortly expanded, columellar margin reflexed, adnate.

Hab. ?

Allied to *A. ovata*, *fricki*, &c.—Pfr.

136. Achatinella vidua Pfeiffer.

A. vidua Pfr. P. Zool. Soc. London, 1855, p. 3, pl. xxx, fig. 10.

A. testa subimperforata, dextrorsa, conico-ovata, striatula, sublente minutissime decussata, nitida, saturate fusca, cæruleo-albido bifasciata; spira convexo-conica, apice obtusula; sutura subsimplice; anfr. 6, vex convexiusculis, ultimo spira paulo breviore, basi rotundo; apertura parum obliqua, truncato-oblonga; plica columellari obsoleta, vix torta; perist. intus valide labiato, margine dextro anguste reflexo, columellari dilatato, subadnato. Long. 18 1-2, diam. 10 mill.

Shell subimperforate, dextral, conic-ovate, somewhat striate, under a lens very minutely decussate, shining, dark brown, encircled with two blue-white bands; spire convex-conic, apex somewhat obtuse; suture quite simple; whorls 6, hardly convex, the last slightly shorter than the spire, base rotundate; aperture hardly oblique, truncate-oblong; columellar fold obsolete, scarcely twisted; lip strongly thickened within, dextral margin narrowly reflexed, columellar margin dilate, subadnate.

Hab. Kahana.

This seems to be a dark form of *A. ovata* Newc.

137. Achatinella cervina Gulick.

A. cervina Gk. Ann. Lyc. New York, 1858, vi, p. 241, pl. viii, fig. 62.

Shell sinistral, scarcely perforate, ovate-conic, rather thin, shining, striated, fawn-colored, with obscure brown spiral lines; apex subacute; spire convexly conic; suture obsoletely margined, moderately impressed; whorls 6, convex; columellar fold central, white, sublamelliform, well twisted; aperture sinuately oval, white within; peristome slightly thickened within; with external margin unreflected, arcuate; columellar margin dilated, adnate; parietal margin wanting.

Length 0.78 in. (20 mill.), breadth 0.45 in. (11 2-5 mill.).

Length of body whorl 0.55 in. (14 mill.).

Average weight 3.80 grains.

Remarks. I have ventured to separate this from *A. ovata* with which Dr. Newcomb placed it, who supposed that its lack of some of the important characteristics of that species was owing to the immaturity of specimens. But even if the specimens were all immature, unless my eye is greatly deceived in tracing its affinities, it may be safely considered more nearly allied to *A. buddii* Newc., or indeed to all the numerous species of that section of the genus, than to any one of the species of the Section Bulimella Pfeiffer, to which *A. ovata* Newc. belongs.—Gk.

Hab. Kahana; very rare.—Gk.

138. Achatinella obliqua Gulick.

A. obliqua Gk. Ann. Lyc. New York, vi, 1858, p. 245, pl. viii, fig. 63.

Shell sinistral, subperforate, ovate, obliquely truncated at the base, solid, shining, striated, of ashen-lead color, with a broad white band beneath the suture; apex obtuse, of a yellowish white color; spire convexly conical; whorls 6, subconvex, the last large; columellar fold central, white, strong; aperture oblique, truncately auriform, nearly white within; peristome white, thickened

within; with external margin somewhat reflected, arcuate; columellar margin forming an obtuse, sinuous ridge with a small umbilical cleft behind it; parietal margin thin.

Length 0.90 in. (23 mill.), breadth 0.50 in. (13 mill.).

Length of body whorl 0.65 in. (16 1-2 mill.).

Average weight 9.00 grains.

Remarks. It is allied to *A. ovata* Newc., with which it is associated geographically, but differs from it in its broader form and white lip. The dark coloring of the body whorl abruptly terminates near the external margin of the peristome, leaving a white border about an eighth of an inch in width around the outside of the lip, whereas in *A. bulimoides* and other allied species the color becomes darker on this portion of the shell, though the lip itself be white. Dextral specimens are very rare. The coloring of the darker portion of the shell varies in different specimens from a dirty cream to slate color, but the ashy color given in the description is the most common.—Gk.

Hab. Kahana.—Gk.

139. Achatinella spadicea Gulick.

A. spadicea Gk. Ann. Lyc. New York, vi, 1858, p. 247, pl. viii, fig. 65.

Shell sinistral, imperforate, conic-ovate, solid, shining, striated, chestnut-brown, with a white sutural band; apex rather obtuse; spire convexly conic; suture marginate, moderately impressed; whorls 6, convex; columellar fold central, white, strong; aperture truncately auriform, subangulated, white within; peristome thickened within, very dark brown; with external margin scarcely reflected anteriorly, compressed; columellar margin strong, callous, adnate; parietal margin very thin.

Length 0.73 in. (18 1-2 mill.), breadth 0.43 in. (11 mill.).

Length of body whorl 0.50 in. (13 mill.).

Average weight 640 grains.

Remarks. The white sutural band is continued up to the very tip of the nuclear whorls, in a manner quite different from what is seen in the bands of *A. obliqua* and other species of this group.—Gk.

Hab. Kahana.—Gk.

140. Achatinella oomorpha Gulick.

A. oomorpha Gk. Ann. Lyc. New York, vi, 1858, p. 246, pl. viii, fig. 64.

Shell dextral, perforate, ovate, solid, shining, striated, ash, or ash-brown, with two obscure brown bands, white beneath the suture; apex rather obtuse, chestnut-brown; spire convexly conical; suture marginate, moderately impressed; whorls 6 1-2, convex; columellar fold central, white, strong; aperture truncately auriform,

white within; peristome thickened within; with external margin slightly reflected anteriorly, arcuate, white, or brown; columellar margin reflected, detached, white; parietal margin very thin.

Length 0.80 in. (20 1-3 mill.), breadth 0.44 in. (11 1-5 mill.).
Length of body whorl 0.55 in. (14 mill.).
Average weight 7.00 grains.

Remarks. Sinistral specimens are sometimes found which resemble *A. obliqua*, but are readily distinguished by the darker coloring around, and upon the lip. I have from Hauula a few specimens which seem to belong to this species. Some of them are nearly white.—Gk.

Hab. Kahana.—Gk.

Mr. Baldwin places this with *A. obliqua* Gk. as a dextral variety.

141. Achatinella rotunda Gulick.

A. rotunda Gk. Ann. Lyc. New York, vi, 1858, p. 249, pl. viii, fig. 67.

Shell sinistral, imperforate, ovate, obliquely truncated at the base, solid, shining, striated, of black chestnut color, with a broad white or yellowish chestnut band beneath the suture; apex obtuse, chestnut; spire convexly conic; suture margined, black, well impressed; whorls 6, convex; the last large, rounded; columellar fold central, white, strong; aperture oblique, truncately auriform; peristome black, slightly thickened within; with external margin slightly reflected anteriorly, arcuate; columellar margin dilated, adnate; parietal margin wanting.

Length 0.83 in. (21 mill.), breadth 0.50 in. (13 mill.).
Length of body whorl 0.61 in. (15 1-2 mill.).
Average weight 8.80 grains.

Remarks. There is a variety with two black bands which resembles certain forms of *A. ovata* Newc., but is distinguished by its black suture and its thinner and more regularly arcuate lip. Its bands are also deep black, while those of *A. ovata* are brown as those in *A. bulimoides* Swains.—Gk.

Hab. Kaaawa and Kahana.—Gk.

BULIMOIDES GROUP.

142. Achatinella bulimoides Swainson.

A. bulimoides Swain. Zool. Ill., iii, p. 108, fig. 1, 1832.

A. testa ovato-oblonga, subventricosa, albente, fasciis castaneis; spira incrassata, apice fusco.

Shell ovate, oblong, subventricose, whitish, with chestnut bands; spire thickened, the lip pale brown.

The ground colour, in some specimens, is pale chestnut or ferruginous, banded with darker shades, and another of pure white: in others the upper half of each whorl is whitish, and the lower chestnut, marked by darker bands: the suture is scarcely, if at all margined by a groove; the aperture and pillar white.—Swain.

Hab. Kawailoa.

This has now become a very rare shell. On one occasion, after a careful search, only one dead shell was found. The habitat of this shell is not far from where the *A. rosea* is found. For that reason it is grouped with that shell. It is, however, quite distinct.

143. Achatinella rosea Swainson.

A. rosea Swain. Zool. Ill., iii, p. 123, fig. 1, 1833.

A. testa sinistrorsa, pallide rosea, fasciis albis obsoletis.

Shell reversed, pale rose-colour, with obsolete white bands.

I place this, for the present, as a variety of the last, to which, except in being reversed, it bears a close resemblance in size, form and general habit. It is entirely of a pale and delicate rose colour, with two obsolete bands of white on the body whorl; the margin of the lip and columella are of a deeper rose colour, and the aperture white. It should be observed, that the marginal groove, which is scarcely perceptible in the last, is, in this, very distinct. —Swain.

Animal, when young, of a bright straw yellow, with ocular apendages tinged with brown. In the adult, the color is a uniform light gray, with mantle and tentacles dark brown.—Newc.

Hab. Wahiawa to Helemano.

This is one of the most attractive of the Achatinellæ. A large number of color varieties can be found, from pure white to bright rose; yellowish brown and even greenish varieties have been found.

GLABRA GROUP.

144. Achatinella glabra Newcomb.

A. glabra Newc. P. Zool. Soc. London, 1853, p. 139, pl. xxii, fig. 25.

Shell conically ovate, glossy; whorls 6, somewhat inflated, margined above; suture well marked; aperture ovate; lip slightly subreflected, dark brown edged with black, thickened within;

columella short, robust, expanded, and terminating in a twisted plait; colour bluish slate, much lighter on the upper portion of the whorls; sometimes transversely banded with white or chestnut. Long. 17/20, lat. 9/20 poll.

Hab. Kolaupoko.—Newc.

145. Achatinella platystyla Gulick.

A. platystyla Gk. Ann. Lyc. New York, vi, 1856, p. 196, pl. vi, fig. 25.

Shell dextral, perforate, elongately ovate, rather thin, shining, finely striated, microscopically very faintly decussated, pale brown above, ash-brown at the base; apex rather obtuse; spire convexly conic; suture scarcely marginate, well impressed; whorls 6 1-2, convex; columellar fold central, white, slightly twisted; aperture a little oblique, semioval, bluish white within; peristome yellowish white, thickened within; with dextral margin anteriorly reflected, arcuate; columellar margin broadly reflected, flattened, not appressed; parietal margin very thin.

Length 0.80 in. (20 1-3 mill.), breadth 0.41 in. (10 2-5 mill.).

Length of body whorl 0.55 in. (14 mill.).

Average weight 4.50 grains.

Remarks. A rare mouse-colored species, in affinity nearly allied to *A. dubia* Newc., but in color bearing a striking resemblance to *A. glabra* Newc., a shell of quite another group, found in the same locality with this.—Gk.

Hab. Kawailoa.—Gk.

This seems to be the same as *A. glabra* Newc. Both Newcomb and Sykes consider it so.

146. Achatinella elegans Newcomb.

A. elegans Newc. P. Zool. Soc. London, 1853, p. 149, pl. xxiv, fig. 57.

Shell conically elongate, polished, shining, rather solid; whorls 6, plano-convex, margined above; suture well impressed; aperture subovate; lip white, expanded, subreflected, somewhat contracted in its centre, thickened within; columella short, flat and lightly toothed; colour light and dark brown alternating, longitudinally arranged in lineations or broad patches; sometimes with a white sutural band, and an additional one on the body whorl. Long. 18/20, lat. 8/20 poll.

Hab. Hauula.—Newc.

2. Waianae Mountains, Oahu.

147. Achatinella lymaniana Baldwin.

A. lymaniana Bald. P. Ac. Phila., 1895, p. 219, pl. x, figs. 12, 13.

Shell sinistral, very minutely perforated, solid, ovate; spire convexly conical, apex subacute; surface shining, covered with fine incremental lines, under a strong lens showing minute decussating striæ; apical whorls smooth, when not eroded. Color dark purplish brown, sometimes with longitudinal or transverse white flecks or zigzag lines; a white line traversing the suture; apex light chestnut. Whorls 6, very lightly margined above, somewhat convex; suture moderately impressed. Aperture oblique, white within, sublunate; peristome acute, thickened within, expanded, the columellar margin slightly reflexed and covering the small perforation, color white on both face and the reverse; columella white, terminating in a slightly developed flexuous fold. Length 20 1-2, diam. 11 1-2 mm.

No opportunity for an examination of the animal has yet occurred. This species is typically very distinct from any other known species of the bulimoid section of Achatinella.—Bald.

Hab. Waianae Mts.—Bald.

This species is the only one of the section found in the Waianae Mts.

IV.

Section **PARTULINA** Pfeiffer.

1. Shells from Oahu.

148. **Achatinella dubia** Newcomb.

A. dubia Newc. P. Zool. Soc. London, 1853, p. 152, pl. xxiv, fig. 65.

Shell dextral or sinistral, thin, conically elongate; whorls 6, with finely decussating striæ; suture simple; aperture ovate; lip expanded, slightly reflected; columella white, bulimoid except in adult specimens (which exhibit a callus); umbilicus small and perforate; colour light corneous with radiating zigzag lines and blotches of a light colour. Long. 16/20, lat. 7/20 poll.

The above shell approaches in its characters very near to the genus Bulimus. It is referred to this genus from its disposition to be either sinistral or dextral; from its animal being viviparous; and from old specimens exhibiting a flat, twisted columellar tooth. It forms the terminus of a series of four species herein described: the others are *A. helena*, *A. physa* and *A. grisea*, all heterostrophe species.—Newc.

Hab. Waianae.—Newc.

Dextral examples are much more common than sinistral.

149. **Achatinella morbida** Pfeiffer.

A. (*Bulimella*) *morbida* Pfr. P. Zool. Soc. London, 1859, p. 30.

T. subperforata, sinistrorsa, ovato-turrita, solidula, striata et striis confertis spiralibus sublente decussata, alba, fusco varie strigata et fasciata; spira elongata, gracilis, apice acutiuscula; sutura simplex; anfr. 6 1-2 vix convexiusculi, ultimus spira paulo brevior, convexus; plica columellaris alba, brevis, obliqua; apertura obliqua, obauriformis; perist. incrassatum, breviter expansum, margine columellari perdilatato, late adnato. Long. 19, diam. 9 mill.

Shell subperforate, sinistral, ovate-turreted, somewhat solid, striate and under a lens decussate with close spiral striæ, white, variously striped and banded with brown; spire elongate, slender,

apex somewhat acute; suture simple; whorls 6 1-2, scarcely convex, the last a little shorter than the spire, convex; columellar fold white, short, oblique; aperture oblique, obauriform; lip thickened, shortly expanded, widely dilated at the margin of the columella, broadly adnate.

Hab. Oahu.—Bald.

Dr. Cooke found the type shell to be near to *A. dubia* Newc.

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2. *Shells from Molokai.*

BELLA GROUP.

150. Achatinella bella Reeve.

A. bella Rve. Conch. Icon. Achat., London, 1850, sp. 17.

Shell conical, dextral, whorls rather ventricose, columella with a twisted plait; olive-yellow, sutures black-brown, then white-banded, last whorl brown and white-banded.

Hab. Kalae to Waikolu.—Bald.

There is a large variety of color markings found in this species. Some examples are almost pure white; others approach very nearly to the following, *A. mighelsiana* Pfr.

151. Achatinella mighelsiana Pfeiffer.

A. mighelsiana Pfr. P. Zool. Soc. London, 1847, p. 231.

Ach. testa ovato-coniformi lævigata, opaca, nitida, nivea, strigis cinereis variegata; spira conica, apice acutiuscula; sutura submarginata; anfractibus 5 1-2 convexis, ultimo infra medium linea nigricante (interdum duplicata) cincto; plica columellari valida, dentiformi, basi castanea; apertura semiovali, fusco-marginata; peristomate simplice, acuto. Long. 17, diam. 8 mill.

Shell ovately coniform, smooth, opaque, shining, snow-white, variegated with ash-colored stripes; spire conical, apex somewhat acute; suture submarginate; whorls 5 1-2, convex, the last encircled below the periphery by blackish line (sometimes doubled); columellar fold strong, tooth-like, base chestnut; aperture semioval, margined with brown; lip simple, acute.

Hab. Kalae.—Bald.

This is generally a white shell, with the exception of the black band mentioned above; however, some examples have a dark sutural band, like *A. bella* Rve., and others are pure white with no bands of any kind.

TESSELLATA GROUP.

152. Achatinella tessellata Newcomb.

A. tessellata Newc. P. Zool. Soc. London, 1853, p. 139, pl. xxiii, fig. 26.

Shell sinistral, oblong-ovate, solid; whorls 6, convex, the last somewhat inflated; white or fawn-coloured ground, very finely shagreened, plain, or variously striped with transverse black or chestnut bands; the upper whorls always tessellated black and white; aperture white or roseate, ovate, effuse below; columella short and broadly callous; lip expanded, thickened within and semireflected; animal light grey, tentacles black, mantle slate-colour. Long. 21/20, lat. 12/20 poll.

Found at Kalai on Tutui trees, and on the broad leaf of the Ti. Has some resemblance to *virgulata* Mighels, but the tessellated top at once distinguishes it.

Animal dark slate above, tentacles of same color; strongly granulate, bottom of foot light olive; mantle black; as long as the shell; movements sluggish.—Newc.

Hab. Kalae to Waikolu.—Bald.

153. Achatinella rufa Newcomb.

A. rufa Newc. P. Zool. Soc. London, 1853, p. 130, pl. xxii, fig. 3

Shell conically ovate, solid; 6 whorls, flatly convex, with decussating striæ; columella strongly callous; suture plain, moderately impressed; umbilicus small and open; lip expanded, and subreflected below; ground colour brownish red, covered with an epidermis of a mottled brown and white, the latter arranged on the central whorls in fine zigzag markings, which are lost on the last whorl in a uniform grayish umber. The inferior half of the last whorl (usually) encircled by a broad white band. Long. 18/20, lat. 10/20 poll.

This is a very rare species, the numbers found scarcely furnishing materials for a description to fix or determine the permanent characters.

Animal light flesh colour, tentacles slightly tinged with brown, mantle dark brown, longer than the shell, movements lively.—Newc.

Hab. Kalae.—Bald.

Over one hundred examples of this shell are in the author's collection. The zigzag markings on upper whorls of a few examples look somewhat like those of *A. tessellata* Newc.

154. Achatinella proxima Pease.

Helicter proximus Pease. P. Zool. Soc. London, 1862, p. 6.

Shell sinistral, imperforate, oblong-ovate, ventricose, rather solid, finely striated transversely; striæ somewhat flexuous, granulose, and interrupted, more regular and conspicuous beneath the sutures. Whorls 6, convex, marginated, the last somewhat produced obliquely and flattened on the middle, so as to give in some specimens a subangulated appearance at the base. Aperture somewhat oblique, of an oblong-ovate form; columellar fold strong. Colour chestnut-brown, striped and mottled irregularly with dark or brown and white; columella and inner edge of aperture purplish red.

Hab. Waikolu.—Bald.

155. Achatinella theodorei Baldwin.

A. theodorei Bald. P. Ac. Philad. 1895, p. 226, pl. x, fig. 27.

Shell sinistral, subperforate, rather thin, elongately conical, apex subacute; surface shining, sculptured with somewhat irregular incremental striæ, and under a lens exhibiting extremely close and minute decussating spiral striæ; nuclear whorls smooth. Color dingy white, striped and mottled irregularly with longitudinal dark brown streaks. Whorls 7, lightly marginate above, slightly convex; suture moderately impressed. Aperture oblique, oval, purplish brown within; peristome acute, margined with brown, very lightly thickened within, columellar margin slightly reflexed, columella terminating in a slight, flexuous, brown fold. Length 18 1-2, diam. 9 mm.

The animal has not as yet been observed. The shell belongs to the group of small elongately conical Partulina, for which Mr. Harper Pease proposed the name Perdicella as a subgeneric title.

The nearest allied species is *A. ornata* Newc., which is of much smaller size, more delicate markings, has a peripheral dark band and inhabits a different island.—Bald.

Hab. Kawela.—Bald.

It seems to be somewhat related to the smaller forms of *A. proxima* Pse.

DWIGHTII GROUP.

156. Achatinella dwightii Newcomb.

A. dwightii Newc. Ann. Lyc. New York, vi, 1855, p. 145.

Shell oblong-conical, sinistral, solid; surface covered with oblique longitudinal striæ, cut across by very numerous fine, slightly undulating, cross striæ; whorls 6, flatly convex, crenulated at the sutures; suture simple, well marked; aperture ovate; columella broad, short, and slightly twisted; outer lip expanded, subreflected below; sub-umbilicated. Color a greyish white, with numerous blotches, and zigzag markings of brown, more obscure on the last whorl; aperture and lip of a dingy white. Long. 19/20, lat. 9 1/2/20 poll.

Remarks. This is also a rare species, offering but few varieties, the only variation from the type being the one figured, in which the suture, instead of being simple, is, in the last whorl, strongly corded.—Newc.

Hab. Kamalo.—Bald.

A series of over one hundred examples is in the author's collection, showing type forms and also darker brown varieties with a white band on the last whorl. This with the following two shells may be grouped together.

157. Achatinella compta Pease.

Partulina compta Pse. J. Conchyl. xvii, 1869, p. 175.

T. sinistrorsa, anguste perforata, solidiuscula, oblongo-conica, spira obsolete transversim tenuiter rugoso-striata (ad anfractum ultimum rugis evanescentibus) et longitudinaliter striis tenuibus, irregularibus impressa; spira turrita aut oblongo-conica; sutura impressa; anfr. 6, convexi, interdum supra subangulati, ultimus 1-2 longitudinis testæ æquans; apertura verticalis, ovata; plica columellaris supera, valida, alba; labro vix expanso, intus calloso; plumbeo-grisea, lineis vel fasciis rufescenti-fuscis cingulata; anfr. ultimus ad basin fascia alba ornatus. Long. 25, diam. 13 mill.

Shell sinistral, narrowly perforate, somewhat solid, oblong-conic, with the spire obsoletely, transversely, thinly wrinkled to striate (the wrinkles disappearing on the last whorl) and longitudinally marked with thin, irregular striæ; spire twisted or oblong-conic; suture impressed; whorls 6, convex, sometimes times sub-angulate above, the last equal to half the length of the shell; aperture vertical, ovate; columellar fold high, strong, white; lip hardly expanded, thickened within; lead colored, encircled by reddish brown lines or bands, the last whorl with a white band on the base.

Hab. Kawela.—Pease.

In appearance, very similar to *A. splendida* Newc., found on Maui. It is nearly related to *A. dwightii* Newc.

158. Achatinella mucida Baldwin.

A. mucida Bald. P. Ac. Philad., 1895, p. 222, pl. x, fig. 23.

Shell sinistral, very minutely perforated, solid, acuminately ovate, conic, apex rather acute; surface shining, marked with fine growth lines, and under a lens decussated by very delicate, close, spiral striæ. The shell of an ashy color, irregularly distributed over the surface, giving it a mucid appearance; with a dark brown band at the periphery which becomes sutural, extending both above and below the suture, and a small patch of the same colour around the umbilicus; also with a few inconspicuous brown lines on the base and above the periphery, the latter continued above; apical whorls generally denuded of cuticle, and then of a light chestnut color. Whorls 7, slightly convex; suture moderately impressed. Aperture oblique, oval, livid white within; peristome acute, slightly thickened within, expanded, basal and columellar margins narrowly reflexed, light brown on both face and the reverse; columella tinged with brown, terminating in a strong, plaited, projecting tooth. Length 21 1/2, diam. 11 1/2 mm.

This species is found in the region intervening between the habitats of *A. redfieldii* Newc. and *A. compta* Pse.; and it has characteristics connecting it with each of these species. It is smaller than either, and differs from both in the coloration, particularly from the former in the absence of the white sutural band. —Bald.

Hab. Makakupaia.—Bald.

VIRGULATA GROUP.

159. Achatinella virgulata Mighels.

Partula virgulata Migh. Proc. Boston Soc. Nat. Hist., vol. ii, 1845, p. 20.

Shell ovate-conic, light fawn color, beautifully adorned with dark brown bands, more or less numerous, imperforate; whorls five, convex; incremental striæ delicate; aperture oblong; lip reflected, slightly inflected. Length 1 in., diam. 3-5 in.

Animal of a uniform bluish white, including the tentacles and mantle; tentacular sheath marked with a light brownish line.—Newc.

Hab. Kaluaaha to Halawa.—Bald.

160. Achatinella redfieldi Newcomb.

A. redfieldi Newc. P. Zool. Soc. London, 1853, p. 131; pl. xxii, fig. 5.

Shell conically elongate, sinistral; whorls 6, margined above, striated longitudinally; suture well impressed; aperture subovate; columella brown, flat and twisted; lip subreflected, of the colour of the columella; colour of shell light fawn passing into deep chestnut, paler above, plain or variously marked with brown bands, and obscure undulations on the third whorl only: a white band traverses the sutures. Long. 20/20, lat. 9/20 poll.

This species belongs to the native group of "Pupu Caniohi," [Kaneohe] or singing snails, and it is with pleasure that we dedicate it to J. H. Redfield, Esq., of New York. It is not an abundant species. Found on Tutui, Ohia and Ti trees.—Newc.

Animal as long as the shell, greyish above, sprinkled slightly with brown, tentacles of same color, mantle slate, bottom of foot of a greenish grey.—Newc.

Hab. Mapulehu.—Bald.

This shell seems to be intermediate between the *dwighti* and *virgulata* groups.

161. Achatinella polita Newcomb.

A. polita Newc. Ann. Lyc. New York, vi, 1853, p. 328.

Shell dextral, polished; whorls 5, convex, margined above; suture well defined; aperture oblong-ovate; columella strongly tuberculate, with purple tip; lip simple; colour yellow, upper whorls tinged with umber; sutures with or without a black band; aperture within white or dark purple. Long. 12/20, lat. 6 1/2/20 poll.—P. Zool. Soc. London 1853, p. 143.

This species shows two varieties with and without the sutural band. The aperture of the first is purple within, of the second a pure white.—Newc.

Animal of a uniform yellowish white including tentacles; tentacular sheath slightly tinged with brown; mantle black.—Newc.

Hab. Kaluaaha to Halawa.—Bald.

This does not go well with any of the groups of this section. Perhaps it might be placed with the *bella* group, but it is a much smaller shell.

162. Achatinella dolium Pfeiffer.

A. dolium Pfr. P. Zool. Soc. London, 1855, p. 5., pl. xxx, fig. 15.

A. testa perforata, ovato-conica, tenuiuscula, leviter striatula, parum nitente, pallide lutescente, fasciis et strigis angustis, fusculis variegata; spira conica, acutiuscula; sutura vix marginata; anfr. 6, convexis, ultimo spiram

paulo superante, ventroso, basi subcompresso; apertura obliqua, obauriformi, intus alba; plica columellari alta, dentiformi, alba; perist. tenui, intus sublabiato, margine dextro anguste expanso, columellari dilatato, patente. Long. 17, diam. 10 mill.

Shell perforate, ovate-conic, quite thin, lightly striated, hardly shining, pale yellow, variegated with narrow brownish bands and stripes; spire conic, somewhat acute; suture hardly marginate; whorls 6, convex, the last slightly longer than the spire, inflated, base subcompressed; aperture oblique, obauriform, white within; columella fold high, dentiform, white; lip thin, slightly thickened within; dextral margin narrowly expanded, columellar margin dilated, spreading.

Hab. Kalae.

It is doubtful just where to place this shell. From the plate it is a dextral shell of about the size of *A. bella* Rve., and may be related to the yellowish forms of that shell. Dr. Cooke found the shell in the British Museum under this name, to be in shape like a small *virgulata*. The fourth and fifth whorls are of a dull yellowish brown color, with numerous bands of a slightly darker shade on the fifth whorl.

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3. Shells from Lanai.

163. Achatinella crassa Newcomb.

A. crassa Newc. P. Zool. Soc. London, 1853, p. 155, pl. xxiv, fig. 71.

Shell dextral, conical, solid, pointed at the apex; last whorl ventricose; striæ decussating; whorls 6, rounded; suture moderate; aperture subovate; columella short, terminating in a very strong plait; lip white, broadly expanded and subreflected; umbilicus open; colour dark chestnut sprinkled with white, with a white subcentral band on the last whorl. Long. 16/20, lat. 10/20 poll.

This shell in form approaches the genus Partula. Having obtained the specimens alive, I have been enabled to examine the animal, and can find no marks to distinguish it from the common type of the genus Achatinella.—Newc.

Hab. Koele.—Perkins.

VARIABILIS GROUP.

164. Achatinella variabilis Newcomb.

A. variabilis Newc. P. Zool. Soc. London, 1853, p. 154, pl. xxiv, fig. 70.

Shell sinistral or dextral, conically acuminate, polished, shining; whorls 6, rounded, lightly margined above; aperture roundly ovate; columella short, armed with a strong tubercle of a roseate colour; lip expanded, acute; colour of shell white, yellow, black and other shades, plain or with from one to six bands of various colours on the last whorl. Long. 14/20, lat. 8/20 poll.

This is the most variable species in markings that has yet been found among the Achatinellæ. It is extremely difficult to find two (except the plain ones) precisely alike in this respect.—Newc.

Hab. Above Waiapaa.—Perkins.

165. Achatinella semicarinata Newcomb.

A. semicarinata Newc. P. Zool. Soc. London, 1853, p. 156, pl. xxiv, fig. 76.

Shell dextrorsal, solid, ovately conical, longitudinally substriated; whorls 5, flattened, marginate above the last, angulated in the middle and semicarinated; aperture ovate; columella ending in a tortuous, obtuse, dentiform plait; outer lip anteriorly produced, strongly marginate within; colour pale yellow; aperture white internally.

A straw-coloured conical species, with the last whorl partially surrounded with an elevated keel.—Newc.

Hab. Lanaihale.

166. Achatinella lactea Gulick.

A. lactea Gk. Ann. Lyc. New York, vi, 1856, p. 198, pl. iv, fig. 27.

Shell sinistral, perforate, acuminately ovate, solid, shining, finely striated, and microscopically very finely decussated, color ivory white; apex acute; spire conical, with outlines slightly convex; suture marginate, slightly impressed; whorls 6 1-2, flatly convex; columellar fold central, brown, strong; aperture oblique, sinuately oval, reddish brown within; peristome white, thickened within; with external margin arcuate, slightly reflected anteriorly; columellar margin dilated, slightly detached; parietal margin thin.

Length 0.86 in. (22 mill.), breadth 0.45 in. (11 2-5 mill.).

Length of body whorl 0.59 in. (15 mill.).

Weight 8.00 grains.

Remarks. A rare shell allied to *A. variabilis* Newc., but well characterized as a distinct species.—Gk.

Hab. Above Waiapaa.—Perkins.

167. Achatinella hayseldeni Baldwin.

A. hayseldeni Bald. Nautilus, x, 1896, p. 31.

Shell sinistral, minutely perforated, rather solid, ovately conical, apex subacute; surface shining, marked with delicate incremental striæ, and under a lens exhibiting very close, minute, decussating spiral lines; embryonic whorls faintly cross-lined. Color generally of a uniform reddish brown; sometimes the coloring of the middle portion of the whorl shades into white on the apical whorls, and in some examples a white line revolves below the suture. Whorls 5 1-2, slightly convex, narrowly margined above, the last carinated or angulated at the periphery, the angle becoming almost obsolete towards the aperture; suture distinctly impressed and often margined above by the continuation of the peripheral keel. Aperture oblique, subovate, white within with a pinkish tinge; peristome white, rather obtuse, thickened within, the basal and columellar margins slightly reflexed; columella terminating in a strong, flexuous, white fold. Length 17 1-2, diam. 10 mm.

Animal when extended in motion longer than the shell. Mantle slate color with a brown band encircling the outer edge. Foot above and below almost white with a yellowish tinge. Tentacles white tinged with slate.

This species is allied to *P. semicarinata* Newc. which is found in another district of the same island. The latter is a light straw-colored, more conical, and invariably dextral shell. The animals of the two species are somewhat similar, but sufficiently different to warrant the separation.—Bald.

Hab. Lanaihale.—Perkins.

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4. *East Maui Shells.*

PORCELLANA GROUP.

168. Achatinella porcellana Newcomb.

A. porcellana Newc. P. Zool. Soc. London, 1853, p. 146, pl. xxiii, fig. 47.

Shell rather solid, conical, polished, shining; whorls 5, rounded, margined above; aperture ovate; lip exanded, thin at the margin, thickened within; columella short, tubercular; colour of a porcelain whiteness, with a light fawn-coloured band encircling each whorl, the last whorl having two. Long. 12/20, lat. 6/20 poll.

Hab. Huelo.

This shell is found in large numbers from Makawao to Nahiku, Maui, and with its several varieties, forms quite a large group.

169. Achatinella nattii Baldwin & Hartman.

A. nattii Bald. & Hart. P. Ac. Phila. 1888, p. 34, pl. i, fig. 3.

Shell dextral, turbinate, spire half the length; whorls 5, polished, the last two rapidly enlarged and inflated. Suture impressed, columella yellow, stout and twisted. Color bright gamboge yellow, with one white and three wide chestnut bands beneath the suture, the latter visible from within the aperture; aperture round ovate, white, labium white, slightly thickened within. Length 16, diam. 10 mm. Length ap. 8, diam. 5 mm.

Hab. Makawao to Honomu.—Bald.

This, with the preceding *A. porcellana* Newc., and *A. flemingi* Bald. (MS), and also *A. wailuaensis* Sykes, form a group very similar in appearance and which run together. They correspond very well to the various forms of the *A. recta* Newc. of Oahu.

170. Achatinella wailuaensis Sykes.

A. wailuaensis Sykes. Fauna Haw., 1900, vol. ii, p. 328, pl. xi, figs. 19, 20.

T. dextrorsa, subperforata, nitida, turrita, solidula, levissime striata, alba, lineis castaneis picta, apud peripheriam zona alba, in sutura linea nigro-castanea notata; anfr. 5–5 1-2, regulariter crescentes, convexi; apertura auriformis; margine columellari plica fusca mediocri munita, margine dextro acuto, callo parietali tenuissimo. Long. 15.5, alt. 8.4 mill.

Shell dextral, subperforate, shining, turreted, somewhat solid, very lightly striated, white, colored with chestnut lines, marked about the periphery by a white zone, in the suture by a black-chestnut line; whorls 5–5 1-2, regularly increasing, convex; aperture auriform, furnished at the margin of the columella with a small brown fold, dextral margin acute, parietal with a very thin callus.

Hab. Wailua.—Perkins.

Very nearly related to *A. porcellana* Newc.

MARMORATA GROUP.

171. Achatinella marmorata Gould.

A. marmorata Gould. P. Boston Soc. Nat. Hist., ii, 1847, p. 200.

Shell dextral, rather solid, of an elongated, acutely conical form, composed of six convex whorls, which are somewhat shouldered superiorly; the last large in proportion, and ventricose;

surface delicately striated with lines of growth; colour a dusky chestnut, marbled with white, irregular, and angular markings, generally arranged somewhat in longitudinal stripes, the whole seeming to be coated with a very thin ash-coloured epidermis. Aperture moderately large, ovate, the lip slightly expanded; the columellar fold white, compressed, nearly transverse, and standing out very prominently. Length 7-8, breadth 1-2 in.—U. S. Ex. Ex., vol. xii, p. 85.

Animal light pea green, strongly granulated, one-third longer than the shell, tentacles light slate; mantle and base of foot same color as the body. Dr. Pfeiffer allows *marmorata* Gould, but places *adamsii* Newc. as a synonym of *A. perdix* Rve. I have clearly established the identity of my shell with that of Dr. Gould, and do not doubt the specific difference of *marmorata* and *perdix*. As Mr. Reeve's description dates 1850, those who do not concur in this opinion must place *A. perdix* as a synonym of *A. marmorata*. —Newc.

Hab. At the foot of Mt. Haleakala.—Gould. Makawao.

This shell is very rarely sinistral. In over one thousand examples only one sinistral specimen was found.

172. Achatinella adamsii Newc.

A. adamsii P. Zool. Soc. London, 1853, p. 137, pl. xxii, fig. 20.

Shell dextral, conically acuminate, whorls 6, finely striated transversely, roughly striated longitudinally; suture deeply impressed; lip expanded; columella terminating in a strong abruptly twisted plait; interior of shell of a leaden blue colour, exterior dark chestnut, irregularly mottled and striped with white. Long. 18/20, lat. 9/20 poll.

This species makes the nearest approach in form to *A. perdix* of Reeve, an immature specimen of which is figured in his Monograph, figure 43. The locality of this latter species is the almost inaccessible ravines of the mountainous districts around Lahaina, W. Maui. The *A. perdix* is arboreal, and the *A. adamsii* terrestrial in its habits.—Newc.

Hab. Makawao.

Baldwin places this with *A. marmorata* Gould.

173. Achatinella plumbea Gulick.

A. plumbea Gk. Ann. Lyc. New York, iv, 1856, p. 213, pl. vii, fig. 39.

Shell dextral, sometimes perforate, ovate-conic, solid, shining, irregularly striated, very finely decussated, lead-colored, with a white band on the periphery of the last whorl; apex subacute;

spire conical; suture marginate, well impressed; whorls 6 1-2, very convex; columellar fold central, white, strong; aperture slightly oblique, sinuately oval, bluish white within; peristome brown, thickened within; with dextral margin arcuate, scarcely reflected; columellar margin dilated, white, sometimes slightly detached; parietal margin wanting.

Length 0.90 in. (23 mill.), breadth 0.50 in. (13 mill.).

Length of body whorl 0.64 in. (16 1-2 mill.).

Average weight 6.00 grains; least weight 4.30 grains.

Var. B. Globose conic, spire shortened, with concave outlines, body whorl inflated.

Var. C. Without the white band on the body whorl.

Station. On the trunks of the Aiea and Kukui (*Aleurites triloba*).—E. Bailey.

Remarks. *A. adamsii* Newc. differs from this in shape, and is covered with a brown unpolished coat more or less broken up with clouds and waves of white; moreover, I believe, that *A. adamsii* is admitted to be a synonym of *A. marmorata* Gould.—Gk.

Hab. Kula.—E. Bailey.

174. Achatinella grisea Newcomb.

A. grisea Newc. P. Zool. Soc. London, 1853, p. 153, pl. xxiv, fig. 66.

Shell sinistral, inflated below, pointed at the summit; whorls 6, rounded, not margined; aperture ovate; columella short, flat and but slightly twisted; lip expanded, thickened within; suture well impressed; umbilicus opened; colour above greyish white mottled with light brown, below ashy grey; the body whorl encircled by a narrow white band. Long. 16/20, lat. 9/20 poll.

Hab. Makawao.—Newc.

This seems unrelated to any of the other shells. It comes very near to *A. physa* Newc., a shell from the island of Hawaii.

175. Achatinella eburnea Gulick.

A. eburnea Gk. Ann. Lyc. New York, vi, 1856, p. 199, pl. vi, fig. 28.

Shell sinistral, usually perforate, ovate-conic, somewhat solid, shining, striated, very minutely decussated, ivory white; apex rather acute; spire concavely conical; suture slightly marginod, lightly impressed; whorls 6, slightly convex; the last large, obliquely produced, and angulated above the aperture; columellar fold central, white, strong, nearly transverse; aperture oblique, truncately auriform, white within; peristome thickened; with

external margin reflected anteriorly, arcuate; columellar margin dilated, slightly detached; parietal margin wanting.

Length 0.95 in. (24 mill.), breadth 0.54 in. (14 mill.).

Length of body whorl, 0.66 in. (17 mill.).

Average weight 9.00 grains; greatest weight 13.00 grains.

Var. B. Brownish yellow, with a white girdle on the periphery of the last whorl, waved with white and yellow on the third whorl.

Var. C. With body whorl rounded, not angulated.

Station. On the trunks of trees, quite exposed.—E. Bailey.

Remarks. This species is the analogue of *A. tappaniana* C. B. Ad., found on W. Maui, but differs from it in its more ventricose form, its angulated body whorl, and more regularly curved lip, besides the difference in coloring.—Gk.

Hab. Honuaula.—E. Bailey.

This and the two following shells, are not related to any of the group of this part of Maui.

176. Achatinella germana Newcomb.

A. germana Newc. P. Zool. Soc. London, 1853, p. 151, pl. xxiv, fig. 61.

Shell dextral, ovately conical; whorls 6, flatly convex; aperture ovate; lip acute, thickened within; columella brown, short and tubercular; colour chestnut, with fine obsolete darker transverse lines; a white band traverses the last sutural whorl and cuts the body whorl centrally; around the columella is a broad white band, losing itself in the aperture. Long. 16/20, lat. 8/20 poll.

Closely resembles the *A. solitaria*, and but for the widely distant localities, might be taken for a variety of the same species. The markings and columellæ are, however, quite distinct.—Newc.

Hab. Makawao.—Newc.

Dr. Cooke found in the type shell the apex and first whorl to be of a dark color, second whorl of a slate color, third whorl of a slate brown, and the fourth whorl brown.

177. Achatinella anceyana Baldwin.

A. anceyana Bald. P. Ac. Phila., 1895, p. 223, pl. x, fig. 16.

Shell dextral, imperforate, rather thin, ovately conical, apex obtuse; surface shining, striated with fine growth lines, under a lens exhibiting a beautiful pattern of close, delicate, decussating, spiral

striæ which extend to the very apex. Color reddish brown becoming paler towards the summit; with two yellow bands, a broad one encircling the umbilical region, a narrow one at the periphery, the latter margined above with a delicate white line, which is continued on the spire just above the suture and becomes lost on the last whorl; also with a narrow white line revolving below the suture to the very tip of the apex. Whorls 5, convex, not marginate; suture distinctly impressed. Aperture a little oblique, oval, white, distinctly exhibiting the dark coloring of the exterior; peristome acute, slightly thickened within, the coloring of the outside appearing on the inner edge; columella brown, terminating in a well developed, flexuous fold. Length 14 1-2, diam. 9 mm.

Animal when extended in motion longer than the shell. Mantle light brown mottled with black, outer edge encircled with an interrupted orange band. Foot above and below a very light brown, superior portion with a slate tinge, posterior portion tapering and sometimes with a yellowish tinge. Tentacles long, light slate. Head above minutely granulated.

This species was collected in the forest of the exterior slope of the extinct Haleakala crater, at an altitude of 4000 feet above sea level. Owing to its peculiar habit of living on the foliage near the tops of trees, it has escaped previous observation. The species has no known congeners. It is remarkable for the constancy of its delicate color lines. Over two hundred examples before me show only trifling divergence in this respect.—Bald.

Hab. Makawao.—Bald.

NIVEA GROUP.

178. Achatinella nivea Baldwin.

A. nivea Bald. P. Acad. Phil., 1895, p. 222, pl. x, fig. 19.

Shell sinistral, subperforate, somewhat solid, acuminately ovate-conic, apex acute; surface highly polished, obliquely striated with fine lines of growth, and under a lens showing very close and delicate decussating spiral striæ; nuclear whorls faintly decussated. Color white, encircled with a narrow, pale chestnut band on or a little below the periphery. Whorls 7, slightly marginate above, flatly convex, the last with a somewhat angular periphery and flattened base. Suture slightly impressed. Aperture oblique, roundly oval, white, the chestnut band of the exterior visible within. Peristome white, acute, thickened within, expanded, basal and columellar margins narrowly reflexed, extremities joined by a very thin white callus. Columella white, terminating in a moderately developed, flexuous plait. Length 24, diam. 14 mm.

Animal when extended in motion longer than the shell. Mantle densely black with minute brown flecks and a broad yellowish band encircling the outer edge. Tentacles and superior portion of foot brown with a slight slate tinge; under portion of foot light brown. Front above covered with light granulations.

I have before me over five hundred examples of this species, which are without variety in color or shape. The peripheral chestnut band is a constant feature. It may be readily distinguished from *A. tappaniana* Adams, by its more slender form and convex spire, by the sub-angulated periphery, flattened base, and more polished surface. The color of the animals is also very different; and the habitats are separated by twenty-five miles expanse of low dry land, which is destitute of forest, and molesting life. In character of shell and animal it has some affinity with the preceding species; and, considering the remote habitats, the two may be regarded as distinct, but allied species.—Bald.

Hab. Makawao to Huelo.—Bald.

179. Achatinella dolei Baldwin.

A. dolei Bald. P. Acad. Phil., 1895, p. 221, pl. x, figs. 17, 18.

Shell sinistral, minutely perforated, somewhat solid, acuminately ovate-conic, apex acute; surface shining, marked with delicate incremental striæ, under a lens exhibiting extremely close, minute, decussating spiral striæ; nuclear whorls faintly cross-lined. Color white, encircled below the periphery with a brownish black band, and at the periphery and above with more or less numerous, delicate, chestnut, spiral lines, which become fainter on the middle whorls and obsolete above. Whorls 6 1-2, narrowly margined above, convex; the last somewhat inflated, roundly angulated at the periphery and flattened on the base; suture deeply impressed. Aperture oblique, roundly ovate, flattened on the basal margin, white, exhibiting the brown markings of the exterior; peristome acute, angled at the periphery, slightly thickened within, expanded, basal and columellar margins narrowly reflexed; columella terminating in a long, flexuous, white plait. Length 24 1-2, diam. 14 mm.

Animal when extended in motion longer than the shell. Mantle intensely black with a broad outer margin of yellow and a conspicuous orange spot in the center of the margin. Foot tapering behind, above and below light yellow. Tentacles long and slender, light slate. Head above slightly granulated.

We found this species very plentiful at the above locality, in the humid forests of the exterior slope of Haleakala crater, at an altitude of 7000 feet above sea level. The dark band below the periphery is a constant feature. The nearest allied species is

A. splendida Newc., of West Maui. It differs, however, from this in the sub-angulated periphery, flattened base, and the untessellated upper whorls. The animals are also different, and the habitats widely separated.—Bald.

Hab. Honomanu.—Bald.

This shell is very rarely dextral. In over two thousand examples Mr. Baldwin found only two full grown dextral specimens.

180. Achatinella fusoidea Newcomb.

A. fusoidea Newc. Ann. Lyc. New York, vi, 1856, p. 144.

Shell sinistral, rather solid, elongately produced; whorls 6–7, scarcely rounded (excepting the last), margined above; suture well impressed; aperture roundly ovate, small; columella very short, robust and twisted; lip simple above, slightly expanded below, color straw yellow. Long. 15/20, lat. 5 1/2/20 poll.

Remarks. This is an exceedingly rare species, but two specimens having come under my observation, one of which serves for the illustration, the other in the cabinet of the late Hugh Cuming of London.—Newc.

Hab. Haleakala.—Newc.

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5. *West Maui Shells.*

SPLENDIDA GROUP.

181. Achatinella splendida Newcomb.

A. splendida Newc. P. Zool. Soc. London, 1853, p. 131, pl. xxii, fig. 4.

Shell sinistral or dextral, solid; whorls 6, with finely decussating striæ; body whorl somewhat inflated; suture moderately impressed, margined below; aperture ovate; lip expanded; columella short, broad and twisted; two upper whorls tessellated with chestnut and white, with numerous chestnut-coloured transverse lines and fillets on the outer whorls, traced on a polished white ground; markings correctly lined superiorly, and irregularly serrated inferiorly. Long. 20/20, lat. 11/20 poll.

Var. A. Bright chestnut banded with white, not serrated.

Var. B. White, with numerous black transverse bands.

Hab. Wailuku, on kukui trees.—Newc. Mauna Hoomaha.—Thaanum.

182. Achatinella baileyana Gulick.

A. baileyana Gk. Ann. Lyc. New York, vi, 1856, p. 202, pl. vii, fig. 31.

Shell sinistral, perforate, ovate-conic, solid, shining, finely striated, microscopically very minutely decussated, with fine oblique white streaks, and narrow black spiral lines; apex subacute, tessellated, spire conic with slightly convex outlines; whorls 6 1-2 or 7, moderately convex scarcely margined; body whorl regularly rounded, equal to 66-100 of the length; columellar fold violet, strong, superior, aperture somewhat oblique, not expanded, roundly semioval, very pale violet within; peristome scarcely reflected, thickened within; with columellar margin reflected, not impressed; parietal margin wanting.

Length 0.85 in. (21 3-5 mill.), breadth 0.50 in. (12 2-3 mill.).
Length of aperture 0.40 in. (10 mill.).
Average weight 7.0 grains.

The dimensions of a large specimen are as follows:

Length 1.00 in. (25 2-5 mill.), breadth 0.53 in. (13 1-2 mill.).
Length of aperture 0.45 in. (11 2-5 mill.).
Weight 7 grains.

Var. B. Regularly conical, rather broad at the base: with spire shortened; whorls nearly 7, convex, not margined; aperture very oblique, semiorbicular, pale blue within.

Length 0.75 in. (17 mill.), breadth 0.51 in. (13 mill.).
Length of aperture 0.34 in. (8 2-3 mill.).
Weight 6.00 grains.

Var. C. Ovate-conic, marble-gray, bands usually wanting, within the aperture pale lilac, whorls somewhat swollen beneath the sutures, columella not so short. This variety passes into the white variety of *A. splendida* Newc.

Var. D. Lightly tinged with pink both within and without.

Remarks. Dr. Newcomb pronounces this to be a variety of his *A. splendida*, but I think the differences too well marked for a doubt in regard to its distinct character.—Gk.

Hab. Wailuku Mountain.—(Ed. Bailey)Gk.

183. Achatinella gouldii Newcomb.

A. gouldii Newc. P. Zool. Soc. London, 1853, p. 129, pl. xxii, fig. 1.

Shell conically ovate; whorls 6, flatly convex, margined above, but slightly; sutures slightly marked; aperture ovate; columella lightly callous; lip expanded and subreflected below; color yellowish white; with zigzag lines of brown on the third whorl, and

brown lineations more or less numerous encircling the three lower whorls; aperture and lip yellowish. Found on kukui trees. Long. 17/20, lat. 9/20 poll.

Hab. Wailuku.—Newc. Mauna Hoomaha, Honokowai.—Thaanum.

184. Achatinella talpina Gulick.

A. talpina Gk. Ann. Lyc. New York, vol. vi, 1856, p. 212, pl. vii, fig. 38.

Shell dextral, slightly perforate, elongate, ovate-conic, rather thin, subcorneous, not shining, finely striated, beneath the lens scarcely decussated, brown with a whitish band encircling the base, covered with a thin brown ash velvety epidermis; apex somewhat obtuse, tessellated with white and chestnut; spire regularly conical; suture simple, moderately impressed; whorls nearly 7, convex; the last regularly rounded, equal to 62/100–67/100 of the length; columella strongly plaited above; aperture semiorbicular, brownish white within; peristome thickened within, scarcely reflected anteriorly; with columellar margin white, and reflected over the deep perforation; parietal margin wanting.

Length 0.85 in. (21 3-5 mill.), breadth 0.47 in. (12 mill.).
Length of aperture 0.36 in. (9 mill.).
Average weight 5.50 grains.

Var. B. With apex corneous, without tessellations; very rare.

Var. C. Ventricose; spire short, curvilinear. A small specimen has the following dimensions:

Length 0.67 in. (17 mill.), breadth 0.42 in. (10 2-3 mill.).
Length of aperture 0.30 in. (7 2-3 mill.).
Average weight 4.50 grains.

Station. On the Kukui (*Aleurites moluccana*).—E. Bailey.

Remarks. This species passes into *A. Gouldii* Newc. Much handling gradually removes the epidermis from the shell, leaving the surface more or less polished.—Gk.

Hab. Wailuku, rare.—(E. Bailey)Gk.

The same as *Gouldii* Newc.—Bald.

185. Achatinella induta Gulick.

A. induta Gk. Ann. Lyc. New York, vol. vi, 1856, p. 207, pl. vii, fig. 34.

Shell dextral, perforate, conic-ovate, solid, unpolished, microscopically very minutely and obsoletely decussated, brown; apex subacute, tessellated with white and chestnut; spire convex and conical; sutures lightly impressed, not margined; whorls 6, slightly convex; the last equal to 66/100–72/100 of the whole length;

columellar folds strong, white, nearly transverse; aperture slightly oblique, sinuously oval, bluish white within; peristome thickened within; with anterior margin slightly reflected; columellar margin dilate, white, unattached; parietal margin very thin, or wanting.

Length 0.83 in. (21 mill.), breadth 0.50 in. (12 2-3 mill.).
Length of aperture 0.40 in. (10 mill.).
Average weight 6.70 grains.

Var. B. Ash-brown, with whitish streaks in spots. This variety passes into *A. undosa* Nob.

Var. C. With a white band on the periphery of the last whorl; very rare.

Var. D. Small, ovate-conic. The dimensions of one of the smaller specimens are as follows:

Length 0.70 in. (18 mill.), breadth 0.40 in. (10 mill.).
Length of aperture 0.34 in. (8 2-3 mill.).
Weight 4.00 grains.

Var. E. Lip considerably expanded and reflected, slightly thickened within, columella broadly reflected. This variety presents a remarkable feature; appearing as if the body whorl had been enlarged, and the lip expanded by a second growth after the shell had been perfected, and the lip thickened. The second growth forms a broad lip, sometimes an eighth of an inch or more in width, from the interior callous ridge to the edge. This lip seems to be of the same material as the thickening within, the exterior being of an unpolished ivory color, not covered with the brown coat which clothes the rest of the shell. The interior of both the lip and columella is of polished ivory-white; aperture within the lip bluish white. Specimens presenting more or less of the features of this variety are not rare.

Station. On the Ilima (*Sida*) and other bushes.—E. Bailey.

Remarks. This species is characterized by its unpolished brown exterior.—Gk.

Hab. Mountain ridges of Wailuku.—(E. B.)Gk.

186. Achatinella radiata Gould.

A. radiata Gould. P. Boston Soc. Nat. Hist., ii, 1845, p. 27.

Testa solida, ovato-conica, lineolis castaneis, flavidis et albidis longitudinaliter picta, interdum fascia mediani vel basali alba; anfract. 6 convexis; sutura marginata, albida; apertura ovata, peristomate reflexo, flavido; plica lata; umbilicata. Long. 3-4, lat. 9-20 in.

Shell solid, ovate-conic, longitudinally colored with chestnut, yellow and whitish lines, sometimes with a median or basal white

band; whorls 6, convex; suture margined, whitish; aperture ovate, lip reflexed, yellowish; fold broad; umbilicated.

Hab. Sandwich Islands.—Gould.(?)

This may belong to the island of Oahu, perhaps with *A. dubia* Newc.

186 a. Achatinella densilineata Reeve.

Partula densilineata Rve. Rve. Conch. Icon. Partula, sp. 9; pl. ii, fig. 9.

Shell acuminately conical, rather thin, umbilicated, sutures of the spire impressed, whorls rather flattened and finely margined at the upper part, rounded and slightly angled at the lower; columella flatly reflected, obsoletely plicate; aperture ovate; lip but little reflected; whitish, very thickly painted with oblique rust and ash lines.

Hab. ?

Mr. Baldwin has placed this with *A. radiata* Gld. as probably from Maui. It may, however, come from some other locality.

TEREBRA GROUP.

187. Achatinella terebra Newcomb.

A. terebra Newc. P. Zool. Soc. London, 1853, p. 144, pl. xxiii, fig. 40.

Shell turreted; whorls 6, rounded, last one inflated, margined above; suture well impressed; aperture elongate-ovate; lip slightly reflected, thickened within; columella short, terminating in a prominent twisted plait; striæ decussating; color light yellow, with wave-like brown-coloured markings, nearly obsolete on the upper whorls; lip, columella and aperture white. Long. 16/20, lat. 6/20 poll.

Hab. Honokowai.—Bald.

188. Achatinella attenuata Pfeiffer.

A. attenuata Pfr. P. Zool. Soc. London, 1855, p. 4., pl. xxx, fig. 12.

A. testa subperforata, ovato-turrita, tenuiuscula, striatula et sublente granulata, alba, strigis corneis saepe angulosis picta; spira concavo-turrita, obtusula; sutura distincte filomarginata; anfract. 5 1-2, superis planis, sequentibus convexis, ultimo 3-7 longitudinis subæquante, rotundato, basi subcompresso; apertura oblique, subtetragono-auriformi; plica columellari valida, compressa, linguæformi; perist. acuto, breviter expanso, intus labiato, margine basali cum columellari dilatato intus angulum formante.

Shell subperforate, ovate-turreted, somewhat thin, slightly striated and under a lens granulated, white, often colored with

light brown zigzag stripes; spire concave-turreted, slightly obtuse; suture distinctly very finely margined; whorls 5 1-2, the upper flat, the following convex, the last nearly equal to 3-7 of the length, rotundate, base subcompressed; aperture oblique, subtetragonal-auriform; columella strong, compressed, tongue-like; lip acute, shortly expanded, thickened within, basal margin with the dilated columellar margin forming an angle within.

Hab. Honokowai.—Bald.

This shell seems to be the same as *A. terebra* Newc.

189. Achatinella lignaria Gulick.

A. lignaria Gk. Ann. Lyc. New York, vi, 1856, p. 209, pl. vii, fig. 35.

Shell dextral, perforate, ovate-conic, solid, more or less shining, microscopically minutely decussated, yellowish ivory white, sometimes streaked; apex subacute, white, obliquely marked with brownish yellow; spire regularly conical; suture moderately impressed, scarcely margined; whorls 6 1-2, somewhat convex; the last equal to 66-100 of the length; columellar folds strong, white; aperture somewhat oblique, sinuously oval; peristome thickened, sometimes slightly expanded and reflected anteriorly; columellar margin dilated, white, unattached; parietal margin wanting.

Length 0.80 in. (20 1-3 mill.), breadth 0.41 in. (10 2-5 mill.).
Length of aperture 0.35 in. (9.00 mill.).
Average weight 5.50 grains.

Var. B. More ventricose; aperture nearly semiorbicular. This variety passes into *A. induta*.

Var. C. More elongate.

Length 0.75 in. (19 1-3 mill.), breadth 0.36 in. (9.00 mill.).
Length of aperture 0.31 in. (8 mill.).
Average weight 3.50 grains.

This variety approaches and passes into *A. terebra* Newc. The two species are, however, distinctly characterized: the latter being more strongly sculptured, having the aperture more elongately oval, and the suture more distinctly margined.

Var. D. With black or brown spiral bands. This passes into *A. splendida* Newc., but is distinguished by its smaller size and stronger columellar folds. Rather rare.

Var. E. White. This passes into *A. attenuata* Pfr.

Var. F. Pale ash color. Passes into *A. undosa* Nob.

Var. G. Pale yellowish brown. Passes into *A. crocea* Nob.

Station. On the Alii and other low trees, in damp elevated regions.—(E. B.)Gk.

Remarks. This species differs from *A. induta* Nob. in its smaller size, more acuminate form, lighter color, and in the polished exterior of some of its varieties.

Hab. Wailuku.—(E. B.)Gk.

Newcomb places this species with *A. terebra* Newc.

190. Achatinella crocea Gulick.

A. crocea Gk. Ann. Lyc. New York, 1858. vi. p. 211, pl. vii, fig. 36.

Shell dextral, perforate, conic-ovate, solid, scarcely shining, lightly striated, and microscopically distinctly decussated with crowded undulating spiral lines, orange-yellow; apex subacute, obliquely marked with white and yellow; spire conical; suture simple, slightly impressed; whorls 6, somewhat convex, the last slightly flattened in the middle, equal to 0.71 of the whole length; columellar fold moderately developed, white; aperture slightly oblique, sinuously oval, snowy white within; peristome not expanded, moderately thickened within; with columellar magin dilated, white, unattached; parietal margin wanting.

Length 0.70 in. (18 mill.), breadth 0.40 in. (10 mill.).

Length of aperture 0.37 in. (9 2-5 mill.).

Weight 4.00 grains.

Hab. Waihee; rare.—(E. B.) Gk.

Baldwin places this with *A. lignaria*, as a color variety.

TAPPANIANA GROUP.

191. Achatinella tappaniana C. B. Adams.

A. tappaniana Ad. Contrib. to Conch., 1850, p. 126.

Shell reversed, elongate ovate-conic; pure white, with one narrow brown spiral band at the periphery of the last whorl; with very unequal and irregular transverse strie, and numerous excessively minute wrinkled spiral impressed lines; apex subacute; spire elongate, with the outlines a little curvilinear; whorls nearly even, moderately convex, and more or less subangular, margined above, with a well impressed suture; aperture ovate; lip well thickened within the margin, expanded much anteriorly, but not alone; columellar fold strong.

Length 1.06 in., breadth .55 in.

Length of aperture .44 in.

Hab. Lahaina.

192. Achatinella fasciata Gulick.

A. fasciata Gk. Ann. Lyc. New York, 1856, vi. p. 201, pl. vii, fig. 30.

Shell sinistral, sometimes perforate, ovate-conic, solid, shining, finely striated, microscopically very minutely and faintly decussated, white, with brown bands; apex subacute, white, with a brown line above the suture; spire regularly conical; whorls 6 or 7, convex, not margined; the last rounded, equal to 65-100 of the length; columellar fold white, superior slightly developed, moderately twisted; aperture somewhat oblique, roundly oval, white within; the bands sometimes appear in pale brownish stripes on the inner surface; peristome white, slightly thickened, subreflected anteriorly; with columellar margin reflected, scarcely adnate; parietal margin wanting.

Average length 0.87 in. (22 mill.), greatest length 0.97 in. (25 mill.), breadth 0.45 in. (11 1-2 mill.).

Length of aperture 0.39 in. (10 mill.).

Average weight 6.80 grains, greatest weight 9.00 grains, least weight 6.00 grains.

Var. B. Thicker and more elongate, with dark brown or black bands; lip well thickened within and deeply colored on the edge opposite the bands; columella slightly toothed.

Var. C. Ventricose, conical; one specimen has the following dimensions: length 0.86 in., breadth 0.54 in., length of aperture 0.40 in.

Station. On the Wiliwili (*Erythrina monosperma*).

Remarks. Has been confounded with *A. tappaniana* and *A. splendida* Newc., but is smaller than the former, with fainter sculpturing and more regular conical spire; it also differs in its dark bands, rounded body whorl, less reflected lip, and slight columellar fold. It resembles *A. splendida* Newc. in its brown bands, but is otherwise quite distinct. A nuclear character which distinguishes it from either of the above is the spiral line on the first whorls.—Gk.

Hab. Honokawai.—(S. T. Alex.)Gk.

Mr. Baldwin calls this a banded variety of *A. tappaniana* Ad.

193. Achatinella ampulla Gulick.

A. ampulla Gk. Ann. Lyc. New York, vi, 1856, p. 200, pl. vii, fig, 29.

Shell sinistral, sometimes slightly perforate, elongate, subpyriform, rather thin, finely striate, scarcely decussate beneath the lens, white, with a broad chestnut band encircling the base, and revolving within the shell beneath the suture, sometimes with fine spiral lines above; apex subacute; spire concavely conical, some-

times decollated; whorls 6 1-2, convex, margined above; the last inflated, equal to 66-100 of the length; columella white, plaited near the whorl, strongly twisted, not tuberculate; aperture rounded; peristome expanded, reflected, very slightly thickened; with columellar margin reflected, adnate, or slightly detached; parietal margin wanting.

Length 0.90 in. (23 mill.), breadth 0.51 in. (13 mill.).
Length of aperture 0.40 in. (10 mill.).
Weight 6.00 grains.

Remarks. This species differs from *A. fasciata* Nob., to which it is closely allied, in the concave outlines of the spire, in its inflated body whorl, and more expanded and reflected lip.—Gk.

Hab. Honokowai.—(S. T. Alex.)Gk.

Mr. Baldwin places this with *tappaniana* Ad.

PERDIX GROUP.

194. Achatinella perdix Reeve.

A. perdix Rve. Rve. Conch. Icon. Achat., London, 1850, sp. 43.

Shell ovate, ventricose, rather thin, dextral, spire exserted, somewhat obtuse at the apex; whorls 6 in number, convex, margined round the upper part, obliquely sculptured flexuous impressed lines; columella plicately twisted, rather callous; whitish, painted and variegated throughout with olive-brown, sutures and columella white.

Animal bluish white; upper tentacles and sheath slate-colored; basal margin of foot bordered with light slate; bottom of foot and mantle greenish white; when extended, not longer than the shell. Few species of the genus pass through a greater variety of changes than this, in form and markings. My collection numbers over twenty, which may fairly be classed as varieties. Of many of them I have examined the animal, and find no difference in color, or so slight as to call for no special notice.—Newc.

Hab. Lahaina.—Bald.

195. Achatinella pyramidalis Gulick.

A. pyramidalis Gk. Ann. Lyc. New York, vi, 1856, p. 204, pl. vii, fig. 32.

Shell dextral, very rarely sinistral, imperforate, pyramidal, rather solid, shining, chestnut or ash-brown, with a white or yellowish band encircling the base, with oblique white or brown markings on the second and third whorls, bluish white within the aperture; apex subacute; spire regularly conical, sometimes de-

collated; whorls 6 1-2, convex, margined with white; finely striated transversely, and microscopically decussated with faintly impressed wrinkled spiral lines; the last regularly rounded, equal to 65-100 of the length; columellar fold well developed, white, oblique, semioval; peristome thickened within, very slightly reflected; with columellar margin dilated, adnate or slightly detached; parietal margin wanting.

Length 0.85 in. (21 3-5 mill.), breadth 0.45 in. (11 2-5 mill.).
Length of aperture 0.38 in. (9 2-3 mill.).
Average weight 5.70 grains.

The dimensions of a large specimen are as follows:

Length 0.90 in. (23 mill.), breadth 0.47 in. (12 mill.).
Length of aperture 0.40 in.
Average weight 6.00 grains.

Remarks. This shell differs from the *A. splendida* Newc., in its smaller size and pyramidal form, with spire less convex, body whorl less ventricose, aperture smaller and less oblique, lip less expanded and reflected. It also differs in being without perforation, and is very rarely sinistral.—Gk.

The *A. perdix* Reeve differs from this in its broader and more ventricose form, its more convex spire, with whorls more swollen, with aperture broader, and frequently subangulated; the arrangement of colors is also different. Looking only at the type of this species, it would be placed in the same group with *A. splendida*, yet is so closely connected by intermediate varieties with *A. perdix* that it has hitherto been considered a variety of that species.

Var. B. With black basal bands. A small specimen has the following dimensions: length 0.80 in.; breadth 0.43 in.; length of aperture 0.35 in.; weight 4.00 grains.

Var. C. Without band. I have a small specimen of the brown variety of *A. splendida* Newc. which closely resembles this.

Var. D. With apex chestnut brown, not tessellated; very rare.

Var. E. With irregular white spots. This variety passes into *A. perdix*.

Hab. Lahaina.—(S. T. Alex.)Gk.

196. Achatinella ustulata Gulick.

A. ustulata Gk. Ann. Lyc. New York, vi. 1856, p. 211, pl. vii, fig. 37.

Shell sinistral, perforate, ovate-conic, obliquely produced at the base, solid, scarcely shining, striated, and microscopically distinctly decussated, brown, with a whitish band encircling the base; apex subacute, tessellated with white and brown; spire conical, somewhat curvilinear; suture simple, lightly impressed, marked with a

narrow white line; whorls 6 1-2, moderately convex; the last large, equal to 72-100 of the length; columellar fold strong, white, oblique; aperture very oblique, sinuously oval; peristome thickened within, reflected anteriorly; with columellar margin dilated, white, unattached; parietal margin wanting.

Length 1.00 in. (25 2-5 mill.), breadth 0.57 in. (14 1-2 mill.).
Length of aperture 0.52 in. (13 1-5 mill.).
Weight 10.00 grains.

Station. On the Mamaki (*Pipturus albidus*).

Remarks. This species is more ventricose than *A. perdix* Rve., and differs in having the whorls more convex, the suture simple, the aperture more oblique, and the sculpturing more distinct. I have received but two specimens, for which I am indebted to the brothers James and Samuel Alexander.—Gk.

Hab. Beautiful Valley.—(S. T. Alex.)Gk.

197. Achatinella undosa Gulick.

A. undosa Gk. Ann. Lyc. New York, vi, 1856, p. 205, pl. vii, fig. 33.

Shell dextral, deeply, narrowly umbilicate or perforate, acuminately ovate-conic, solid, shining, finely striated, and microscopically very faintly decussated, lead-gray, streaked and waved with black, brown and white; apex subacute, tessellated with white and chestnut; spire conic; whorl 6 1-2, somewhat swollen above, slightly margined; the last equal to 0.65 of the length; columella white, moderately plicate; aperture somewhat oblique, sinuously oval; peristome thickened within, slightly reflected anteriorly; with columellar margin dilated, unattached; parietal margin wanting.

Length 0.93 in. (23 mill.), breadth 0.47 in. (12 mill.).
Length of aperture 0.42 in. (10 2-3 mill.).
Average weight 5.50 grains.

The dimensions of a large specimen are as follows:

Length 1.00 in. (25 1-5 mill.), breadth 0.50 in. (12 2-3 mill.).
Weight 8.00 grains.

Var. B. Much smaller.

Length 0.74 in. (19 mill.), breadth 0.42 in. (10 2-3 mill.).
Length of aperture 0.33 in. (8 2-5 mill.).
Weight 4.00 grains.

Var. C. With interrupted dingy white bands encircling the base; quite rare.

Var. D. Ventricosely ovate; spire short; whorls 6, swollen, the last flattened in the middle; rare.

One specimen is of the following dimensions:

Length 0.85 in. (21 3-5 mill.), breadth 0.52 in. (13 2-5 mill.).
Length of aperture 0.43 in. (11 mill.).
Weight 7.00 grains.

Var. E. Finely and faintly streaked with whitish lines.

Var. F. Whitish marble gray; lip, columella and fauces ivory white.

Var. G. Exterior ashy, without polish; lip ivory white; columella plicate: passes into *A. induta* Nob.

Var. H. Variegated with black, white and brown, perforate, columella more distinctly plicate: passes into *A. perdix* Reeve.

Station. On the Ilima (*Sida*), Ki (*Cordyline terminalis*) and other low bushes.—E. Bailey.

Remarks. This species is smaller in size and more acuminate in form than *A. perdix*, and differs in having the umbilicus open and deeply perforated, and the columellar fold less prominent.—Gk.

Hab. Mountain ridges of Waihee.—(E. Bailey)Gk.

Baldwin places it with *A. perdix* Rve.

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6. Shells from Hawaii.

PHYSA GROUP.

198. Achatinella physa Newcomb.

A. physa Newc. P. Boston Soc., 1855, p. 218.

Shell sinistral, pointed at the summit, strongly inflated below, rudely striated obliquely; whorls 6, first five flatly convex, the last largely inflated and obsoletely carinated; suture simple and deeply impressed; columella short, slightly callous, broad, and partially covering a deep umbilicus; aperture large, semiovate; lip subreflected below, thin and simple above. Color of a dingy white, occasionally marked with yellow flammules, internally of a light lemon yellow, sometimes white. Length 18-20, breadth 12-20 poll.

Originally described in Zoological Proceedings, London, 1854, plate 24, fig. 64, in an immature state.

Hab. Mauna Kea and Kohala Mts.

Fine specimens are now found beautifully banded.

199. Achatinella hawaiiensis Baldwin.

A. hawaiiensis Bald. P. Ac. Philad., 1895, p. 225, pl. x, figs. 24-26.

Shell sinistral, minutely perforated, very thin, acutely conical, apex acute; surface rather lustreless, covered with fine lines of growth, and under a lens showing extremely close and delicate decussating spiral lines; nuclear whorls faintly decussated. Color very variable, plain brown or dingy white, sometimes irregularly striped or mottled with brown or white, the base uniformly brown, but sometimes with undulating markings of brown and white; the only constant characters being a brown, sometimes interrupted, line at the periphery, bordered below with a broader white line. Whorls 6, slightly convex, the last inflated. Suture lightly impressed. Aperture oblique, oval, brown, the peripheral brown and white bands distinctly marked within. Peristome acute, not thickened within, external margin straight, basal expanded, the expanded portion being very thin and fragile, the columellar margin reflected over the minute perforations; color white on both face and the reverse. Columella white, very slightly developed, plain and smooth. Length 18, diam. 10 1-2 mm.

Animal when extended in motion longer than the shell. Mantle almost white, margin of a darker shade. Foot above and below dingy white, superior portion sometimes flecked with gray. Tentacles of darker shade.

This species also belongs to the group of *A. physa* Newc., but is readily distinguished by its smaller size, smoother surface, delicate lip, and arrangement of colors. The habitats are also widely separated, and the animals differ.—Bald.

Hab. Hamakua.—Bald.

200. Achatinella horneri Baldwin.

A. horneri Bald. P. Ac. Philad., 1895, p. 224, pl. x, fig. 20-22.

Shell sinistral, minutely perforated, thin, globose with a short acutely conical spire, apex acute; surface shining, striated with fine incremental lines, and under a lens exhibiting very close and delicate and decussating spiral striæ; embryonic whorls faintly cross-lined. Color dull white, encircled at the periphery with a faint brown zone, which is continued on suture, also with a very small patch of the same color around the umbilicus. Whorls 6, the upper five slightly convex, the last very much inflated, forming the greater part of the shell; suture distinctly impressed. Aperture oblique, subrotund, very large, white within, distinctly showing the external peripheral band, peristome margined with light brown, rather thin, very slightly thickened within, expanded, basal and columellar margins narrowly reflected, extremities

slightly convergent and united by a thin callus; columella light brown, very slightly developed, plain and smooth. Length 24, diam. 18 mm.

Animal in motion longer than the shell. Mantle black, margined with gray. Foot above and below gray, the superior portions lightly granulated. Tentacles light gray.

There occurs also a pure white form of the shell without the peripheral band, and a form white with a light chestnut band on the apical whorls. The animals of these varieties vary only a trifle from that of the typical form.

This species belongs to the group of *A. physa* Newc., but is easily distinguished by its much more inflated body whorl, and smaller spire, its smoother and polished surface. The habitats of the two species are widely separated and the animals are entirely different. The animal of *A. physa* mantle and foot, is a dingy white with a greenish yellow tinge.

We dedicate the species to Mr. J. Lewis Horner, the young naturalist to whom science is indebted for the discovery of this ..... species. They are valuable additions to the shells of the Island of Hawaii, which has heretofore furnished only one described arboreal species of Achatinella.—Bald.

Hab. Hamakua.—Bald.

V.

Section **LAMINELLA** Pfeiffer.

1. Shells from Oahu.

GRAVIDA GROUP.

201. Achatinella gravida Férussac.

A. gravida Fér. Deshayes Hist. Moll., ii, p. 192, pl. clv, figs. 3, 4.

A. testa sinistrorsa, inflata; spira conica, acuta; epidermide brunneofugaci; anfractibus 5 1-2, suturis non duplicatis; apertura semilunata, alba; peristomate intus incrassato; columella alba costa distincta unita; rima umbilicali.

Shell sinistral, inflated; spire conic, acute; with a brown deciduous epidermis; whorls 5 1-2, with the suture not duplicate; aperture almost lunate, white; lip thickened within; columella with a single distinct white rib; subperforate.

The *suffusa* Rve. is a roseate variety with the epidermis removed. This occasionally occurs while the animal still inhabits the shell. In the Imperial Museum the original type of Férussac is preserved, with a specimen of *A. straminea* Rve. as a variety, on the same tablet.—Newc. (Ann. Lyc. New York, vi, p. 307.)

Hab. Niu to Kalihi.

202. Achatinella dimondi Adams.

A. dimondi Adams. Ann. Lyc. New York, v, 1852, p. 42.

Shell reversed, thick, long ovate-conic; dingy white or very pale yellowish brown, with a blackish margin to the aperture when mature; with a greenish black fugacious epidermis; with transverse striæ rather slight, very unequal and irregular, without spiral striæ; apex subacute; spire rather long, with the outlines moderately curvilinear; whorls nearly 7, quite convex, with the suture well impressed; last whorl often somewhat flattened on the

middle; aperture subovate, with the columellar fold well developed, with the deposit on the inner side very thin; labrum sharp, not reflected, well thickened within.

Length 1 in., breadth .5 in.
Length of aperture .38 in.

Hab. Palolo to Kalihi.

This species is the same as *A. gravida* Fér.

203. Achatinella suffusa Reeve.

A. suffusa Rve. Rve. Icon. Conch., London, 1850, pl. ii, fig. 11.

Shell sinistral, oblong-ovate, whorls convex, somewhat rudely striated, columella with a twisted plait, aperture simple; pinkish-white, brown-red at the apex, interior of the aperture flesh-pink.

Hab. Kalihi.

This shell is commonly called the "pink *gravida*", and is a variety of that shell.

204. Achatinella straminea Reeve.

A. straminea Rve. Rve. Icon. Conch., London, 1850, pl. v, fig. 38.

Shell acuminately oblong, sinistral, whorls convex, obliquely striated, columella strongly twisted-plaited; straw-colored, unspotted.

Animal of a uniform light flesh-color, oral aperture margined with a line of orange.

Hab. Pauoa to Palolo.—Bald.

SANGUINEA GROUP.

205. Achatinella sanguinea Newcomb.

A. sanguinea Newc. P. Zool. Soc. London, 1853, p. 135; pl. xxii, fig. 15.

Shell accuminately oblong; whorls 7, convex below, planoconvex above; suture distinctly marked; aperture subovate; columella armed with a twisted plicate tooth; lip simple; colour of shell from roseate to sanguineous thickly covered with black lineations, forming chainwork and zigzag markings on the three lower whorls; denuded of epidermis above; apex mammillate and black. Long. 18/20, lat. 8/20 poll.

Animal as long as the shell, anterior superior portion a dark brown, with tentacles of the same color, posteriorly cut up into

squares and other geometrical figures by light-colored lines. Mantle light flesh color, bottom of foot light green.

The type of Dr. Pfeiffer's species is a large sized *A. sanguinea*, with the black markings carefully removed by design or accident. This specimen is in the magnificent museum of Mr. Cuming.—Newc. (Ann. Lyc. New York, vi, p. 326.)

Hab. Lihue.—Newc. Wahiawa and Waianae Mts.

206. Achatinella ferussaci Pfeiffer.

A. ferussaci Pfr. P. Zool. Soc. London, 1855, p. 203.

A. testa sinistrorsa, perforata, turrita, solida, subruditer striata, nuda, coccinea; spira elongata, subconcavo-conica, apice fusca, obtusiuscula; sutura profunda, subcrenata; anfra. 7 1-2, superioribus planiusculis, sequentibus convexis, ultimo globoso, 1-3 longitudinis non æquante; apertura diagonali, sinuato-semicirculari; columella distincte biplicata; plica supera obliqua, obtusa, altera compressa, illi subparallela; perist. nigro-limbato, margine externo recto, acuto, columellari dilatato, patente. Long. 24, diam. 11 mill.

Shell sinistral, perforate, turreted, solid, quite roughly striated, without an epidermis, scarlet; spire elongate, slightly concavely conic, apex brown, somewhat obtuse; suture deep, slightly crenulate; whorls 7 1-2, the upper somewhat flat, the following convex, the last globose, not equal to one-third of the length; aperture diagonal, sinuately semicircular; columella distinctly biplicate; the upper fold oblique, obtuse, the other compressed, nearly parallel to the first; lip edged with black, external margin erect, acute, columellar margin expanded, spreading.

Hab. Helemano.

This is the same as *A. sanguinea* Newc.

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2. *Shells from Molokai.*

VENUSTA GROUP.

207. Achatinella venusta Mighels.

A. venusta Migh. P. Boston Soc., ii, 1845, p. 21.

Shell sinistral, conical, body whorl large and tumid, reddish yellow, beautifully ornamented with black zigzag lines, more or less numerous and regular, perforate; whorls 6, convex; aperture subovate; lip simple, acute. Length 3-5, diam. 4-15 in.

Animal slender, body flesh color with black puncta down the sides; tentacles very black, superior ones long, inferior ones short.

When extended, two-thirds as long as the shell.—Newc. (Ann. Lyc. New York, vi, p. 311.

Hab. Mapulehu.—Bald.

208. Achatinella citrina Pfeiffer.

A. citrina Pfr. Rve. Icon. Conch. Achat., London, 1850, pl. v, fig. 33.

Shell elongately conical, sinistral, spire somewhat accuminated, whorls rounded, finely striated, the last finely obsoletely keeled, columella much twisted, two-plaited, aperture rather small; bright citron yellow.

Hab. Kalae to Waikolu.—Bald.

209. Achatinella helvina Baldwin.

A. helvina Bald. P. Acad. Phil., 1895, p. 227, pl. xi, fig. 30.

Shell sinistral, imperforate or subperforate, sometimes narrowly and deeply perforated, rather thin, elongately conical, apex rather acute; surface scarcely shining, covered with very fine incremental striæ; nuclear whorls smooth; color uniform white or dingy yellow, with a few black markings on the upper whorls; whorls 6 1-2, lightly margined above, convex; suture deeply impressed; aperture a little oblique, oval, white, with the tint of the outside; peristome simple, thin, margins connected with a thin orange-yellow callus; columella biplicate; the terminal plication a thin, oblique lamellar plait, the inner one less prominent, tortuous, of an orange-yellow color. Length 18, diam. 10 mm.

Animal extended in motion as long as the shell. Mantle and foot above and below very light brown. Tentacle very dark slate, with a sprinkling of slate on the sides of the foot. Posterior portion of foot very tapering and thickly studded with minute red spots. A remarkably prolific species; 4 or 5 embryonic shells in successive stages of growth often observed in the oviducts. A jaw is present and the dentition is the same as that of the *Amastra* species. The tooth formula of this species is $32.1.32 \times 108 = 7020$. The central tooth is a little wider than usual.—Prof. Gwatkin.

This shell differs from all its congeners in its strongly biplicate columella, and the peculiar soft parts of the animal. The typical forms are found in the small valley of Ohia on Molokai. Departing from this locality on either side, modified forms without the biplicate columella are somewhat common.—Bald.

Hab. Ohia Valley, near Kaluaaha.—Bald.

210. Achatinella depicta Baldwin.

A. depicta Bald. P. Acad. Phil., 1895, p. 228, pl. xi, figs. 33-35.

Shell sinistral, sometimes slightly perforate, rather thin, elongately conical, apex subacute; surface shining, striated with very delicate growth lines; nuclear whorls smooth; color light yellow or reddish yellow, plain or marked with numerous black, anastomizing veins; apex almost black in some examples; whorls 7, faintly margined above, somewhat convex, suture distinctly impressed; aperture a little oblique, oval, white or pinkish, the outside markings visible within; peristome simple, very thin; columella white, subplicate, tortuous, abruptly terminating in a thin lamellar plait. Length 15 1-2, diam. 6 1-2 mm.

Animal extended in motion shorter than the shell. Mantle very light brown. Foot above and below almost white. Tentacles short, light brown.

This species is allied to *A. alexandri* Newc., from the Island of Maui, and to *A. remyi* Newc., from the Island of Lanai, but differs from both in the color and habits of the animal.—Bald.

Hab. Kamalo.—Bald.

3. *Shells from Lanai.*

REMYI GROUP.

211. Achatinella remyi Newcomb.

A. remyi Newc. Am. Jour. Conch., ii, 1866, p. 215, pl. xiii, fig. 13.

Shell accuminately elongate, striæ numerous, well defined, obliquely longitudinal; whorls 7, rounded, minutely margined above or plain; suture rather deep; aperture subovate; columella slightly callous, with a terminal lamellar plait; color salmon, painted with numerous zigzag black lines continuous from the summit to the base of the shell; lip margined within with reddish-purple. Long. 14/20, lat. 6/20 poll.

Remarks. This species is of great rarity, only a few specimens having been collected. It is not so robust a shell as the preceding, with which it had affinities, as also with *sanguinea* and *picta*. The measurements from adult specimens give the following results, viz: *A. picta*, 19/20×8 1-2/20; *A. tetrao*, 15/20×9/20; *A. sanguinea* 18/20×8/20; *A. remyi*, 14/20×6/20.—Newc.

Hab. Mountains behind Koele.

212. Achatinella tetrao Newcomb.

A. tetrao Newc. Am. Jour. Conch., 1866, ii, p. 214, pl. xiii, figs. 11, 12.

Shell sinistral, acutely conical, pointed at the summit, inflated below; whorls 6, rounded; suture deep; aperture subovate; columella short and broadly plicate; color white, covered with a thin epidermis, with black and brown undulations often so dense as to cover most of the shell; a broad sutural carmine band is a constant character; aperture within white; columella and adjoining portion of the base of the shell pink or orange. Long. 15/20, lat. 9/20 poll.

Remarks. There is a beautiful group of these finely painted acuminate Achatinellæ, commencing with *A. venusta* Mighels, and containing the following series: *A. venusta* Mighels, *A. citrina* Mighels, *A. remyi* Newc., *A. sanguinea* Newc., *A. tetrao* Newc., *A. picta* Mighels. The four central islands of the group are represented by these species, the first two from Molokai, *sanguinea* from Oahu, *picta* from Maui, the other two from Lahaina.—Newc.

A fine, light colored variety, with a rosy tip, is occasionally found, but is much less common than those with a dark epidermis studded with small, white triangular markings.—Newc.

Animal, above tessellated brown and white; mantle of a dusky yellow; bottom of foot of same color; margined with white; tentacles long and of light brown; motions timid.—Newc. (An. Lyc. New York, vi, p. 334.)

Hab. Mountains and behind Koele.—Perkins.

It may be noted that *A. férussaci* Pfr. has been omitted from this association as the typical shell in Mr. Cumings collection is a worn, rather large sized *sanguinea*.

213. Achatinella concinna Newcomb.

A. concinna Newc. P. Zool. Soc. London, 1853, p. 157, pl. xxiv, fig. 79.

Shell dextrorsal, umbilicated, longitudinally very finely striated, rather shining; whorls 6, convex; suture impressed; aperture ovate; columella short, straight, the margin reflected, furnished anteriorly with a spiral plait; outer lip simple, acute; color pale yellow; the uppermost whorls rosy.

Hab. Koele side of highest point, and near Koele at 3000 feet.—Perkins.

This shell does not belong in the Remyi group, but being from Lanai is placed here at the end.

4. Shells from Maui.

PICTA GROUP.

214. Achatinella picta Mighels.

A. picta Migh. P. Boston Soc., ii. 1845, p. 21.

Shell sinistral, short, thick, conical, light yellow, with black zigzag lines, more or less numerous, perforate; whorls 6, convex; aperture campanulate; lip simple, acute. Length 7-10, diam- 2-5.

Hab. Lahaina and Makawao.—Bald. Haleakala, at 4000 feet, and Iao Valley.—Perkins. Moomuku, Kahana and Honokohau, West Maui.—Thaanum.

215. Achatinella alexandri Newcomb.

A. alexandri Newc. Am. Jour. Conch., ii. 1866, p. 216, pl. xiii, fig. 14.

Shell perforate; left-handed, elongately subcylindrical, shining, reddish brown, with painting elongate, inosculating black veins; whorls 6, convex, regularly but slowly increasing; apex a little obtuse, suture moderately impressed; not emarginate; aperture small, subovate; lip acute; columella white, short, almost straight, truncate, terminating by a twisted plait passing within. Long. .6, diam. .25 in.

Remarks. This species is more cylindrical than any of its congeners, resembling most *A. remyi* Newc., which is longer, not umbilicate, more pointed at the apex, with a twisted, not truncate columella.

From *venusta* and *citrina* Mighels, it varies both in form and color. With some varieties of *picta* it claims analogy only in the general plan of painting. Its striking characteristics are its blunt apex, slightly rounded whorls, small aperture, short and white columella, umbilicus, and general plan of coloring.

Hab. A few specimens were collected at an elevation of 7500 feet on West Maui by the Rev. J. M. Alexander, to whom the species is dedicated. — Newc. Puu Kukui. — Thaanum. Top of West Maui.—Bald.

216. Achatinella bulbosa Gulick.

A. bulbosa Gk. Ann. Lyc. New York, 1858, vi, p. 253, pl. viii, fig. 71.

Shell sinistral, imperforate or sometimes slightly perforate, subpyriform, rather solid, unpolished, striate, yellowish white, covered with irregular streaks of black epidermis, which blend in

broad patches towards the base: apex acute; spire concavely conic; suture simple, well impressed: whorls 7, convex, the last large; columellar fold central, brown, lamelliform, nearly transverse; aperture oblique, sinuately lunate, pale pink within; shading to brown near the columella; peristome thin, acute; with external margin unreflected, arcuate; columellar margin dilated, adnate, or sometimes slightly detached; parietal margin wanting.

Length 0.85 in. (21 3-5 mill.), breadth 0.52 in. (13 1-5 mill.).

Length of body whorl 0.60 in. (15 1-2 mill.).

Average weight 7.00 grains.

Station. On trees and vines.—Rev. J. M. Alexander.

Remarks. I have a dextral specimen, which is the only one I have seen belonging to any species of this group.—Gk.

Hab. Honuaula.—(E. Bailey.)Gk. Kula.—Rev. J. M. Alexander.

217. Achatinella erecta Pease.

A. erecta Pease. J. Conchyl., xvii, 1869, p. 174.

Shell dextral, imperforate, somewhat solid, turreted, irregularly finely striated, scarcely shining, covered with a thin epidermis; whorls 7, convex, the last equal to 2-5 of the length; suture impressed; columellar fold laminate, callous, hardly oblique; aperture ovate; columella arcuate; straw color or yellowish, with a purplish apex. Long. 15, diam. 7 1-2 mill.

Hab. Kahakuloa, West Maui.—Thaanum.

I do not know of any other species with which this may be compared. It is not included in the Picta group.

VI.

Section **PERDICELLA** Wm. H. Pease.

1. Shells from Molokai.

218. Achatinella helena Newcomb.

A. helena Newc. P. Zool. Soc. London, 1853, p. 151, pl. xxiv, fig. 63.

Shell ovate-conical; whorls 5, rounded; suture deep; aperture ovate; columella slightly callous; striæ finely decussated; color rufous; alternating with broad, longitudinal, zigzag lines of white covering the entire shell, with or without a white band encircling the last whorl. Long. 10/20, lat. 5 1-2/20 poll.

Within the coil of the Ki tree leaf, as it starts from the trunk. —Newc.

Hab. Kamalo to Kalae.—Bald.

2. Shells from East Maui.

MAUIENSIS GROUP.

219. Achatinella mauiensis Newcomb.

A. mauiensis Newc. P. Zool. Soc. London, 1855, p. 207.

Shell subperforate, ovate-oblong, slender, longitudinally irregularly striate under the lens spirally and densely decussately striate, not shining, white, with broad, serrated longitudinal, brownish streaks; spire regularly conical, apex obtuse; suture smooth, scarcely submargined; whorls 5 1-2, flattened, the last equal to 2-5 of the shell; base subattenuated; aperture oblong, not oblique; columellar plication obsolete; lip simple, straight, brown-margined; columellar margin reflexly arched, partially adherent. Long. 5, lat. 25 in.

Remarks. This species might, with more propriety, be placed under Bulimus, as the Genus Achatinella was originally defined

by Swainson. This has, however, been enlarged by Dr. Pfeiffer to include the numerous late additions of aberrant forms with which Swainson was not acquainted.—Newc.

Hab. Makawao to Huelo.—Bald.

220. Achatinella zebrina Pfeiffer.

A. zebrina Pfr. P. Zool. Soc. London, 1855, p. 202.

A. testa imperforata, dextrorsa, tenuiuscula, lævigata (sublente minutissime decussata), nitida, albida, strigis fulgurantibus nigro-castaneis elagantissime picta; spira subturrita, apice obtusa, fusca; sutura filomarginata; anfr. 5 modice convexis, ultimo 3-7 longitudinis fere æquante; apertura vix obliqua, truncato oblonga, intus lilacina; plica colum. supera, torta, callosa, vix prominente; perist. simplice, recto, fusco-limbato. Long. 12 1-2, diam. 6 mill.

Shell imperforate, dextral, quite thin, smooth (under a lens very minutely decussate), shining, whitish, very beautifully colored with shining black chestnut stripes; spire subturreted, apex obtuse, brown; suture finely margined; whorls 5, moderately convex, the last almost equal to 3-7 of the length; aperture scarcely oblique, truncate-oblong, lilac within; columellar fold high, twisted, thickened, hardly prominent; lip simple, erect, edged with brown.

Hab. Makawao to Huelo.—Bald.

221. Achatinella zebra Newcomb.

A. zebra Newc. Ann. Lyc. New York, vi, 1855, p. 142.

Shell dextral, conically elongate, shining with microscopic decussating striæ; whorls 5 1-2, rounded, narrowly margined above; suture well marked; aperture ovate; lip thin; columella short, abruptly terminating in a large prominent plait; color of epidermis yellowish white, alternating with longitudinal chestnut lines; base of umber color, with a revolving line of the same color above. Long. 11/20, lat. 5/20.

Hab. East Maui.—Newc. Makawao.

Dr. Cooke found the type shell to be different from *zebrina* Pfr. The apex is dark, on the third and fourth whorl are irregular brown and white stripes, a dark narrow band followed by a narrow light band encircles the base; the lower part of the base is dark brown.

222. Achatinella fulgurans Sykes.

Perdicella fulgurans Sykes. Fauna Haw., 1890, vol. ii. p. 329, pl. xi. fig. 5.

T. subperforata, dextrorsa, ovato-turrita, nitida, sublente lineis spiralibus confertim sculpta, albida, strigis fulgurantibus castaneis elegantissime picta, sutura modice impressa, apice obtusulo; anfr. 5 1-2, plano-convexi, ultimus 2-3 longitudinis testa æquans; apertura ovato pyriformis, intus lilacina; peristoma margine dextro simplici, columellari subreflexo; plica columellaris torta, subprominens, mediocris, rapide ascendens. Long. 16, lat. 8; long. apert. 8.1, lat apert. 4.9 mill.

Shell subperforate, dextral, ovate-turreted, shining, under a lens densely marked with spiral lines, whitish, most beautifully colored with shining chestnut stripes, suture moderately impressed, apex somewhat obtuse; whorls 5 1-2, plano-convex, the last equal to 2-3 of the length of the shell; aperture ovate-pyriform, lilac within; lip simple at right margin, columellar margin subreflexed; columellar fold twisted, quite prominent, moderate, ascending rapidly.

This pretty shell is akin to *P. zebrina* Pfr., but may be readily separated from it by its greater size, by being much broader in proportion to the length, and by the color-pattern being finer in design and more zigzag.—Sykes.

Hab. Makawao to Huelo.—Bald.

3. *Shells from West Maui.*

223. Achatinella ornata Newcomb.

A. ornata Newc. P. Zool. Soc. London, 1853, p. 149, pl. xxiv, fig. 55.

Shell sinistral, acutely pyramidal, shining; whorls 6, plano-convex, margined above; suture well impressed; aperture subquadrate in adult, subovate in immature shells; lip slightly thickened at the edge; columella broad and flattened; surface of shell covered with alternating undulations or zigzag markings of white and black arranged longitudinally, with the subcentral transverse black band, sometimes margined with a white one below on the last whorl. Long. 10/20, lat. 4/20 poll.

This is an extremely rare species, found in a limited locality in a deep ravine at the back of Lahaina.—Newc.

Hab. Lahaina.—Newc.

This does not seem related to any of the other shells found in this part of Maui.

224. Achatinella minuscula Pfeiffer.

A. minuscula Pfr. P. Zool. Soc. London, 1855, p. 4, pl. xxx, fig 14.

T. subimperforata, sinistrorsa, ovato-turrita, tenuiuscula, sublente minute decussata, vix nitidula, fuscescenti-albida; spira turrito-conica, apice obtusiuscula; sutura simplex; anfr. 5 vix convexiusculi, mediani fusco-variegati, ultimus spira paulo brevior, fascia fusca circumdatus et basi rotundata fusco-areolatus; columella vix plicata; apertura parum obliqua, semiovalis; perist. simplex, acutum, margine columellari superne dilatato, reflexo. Long. 10, diam. 5 mill.; ap. 4 1-2 mill., longa, 2 2-3 lata.

Shell subimperforate, sinistral, ovate-turreted, quite thin, under a lens minutely decussated, hardly shining, brownish-whitish; spire turreted-conical, apex somewhat obtuse; suture simple; whorls 5, scarcely convex, the middle variegated with brown, last a little shorter than the spire, encircled by a brown band, base rotundate, brown-areolate; columella scarcely plicate; aperture hardly oblique, semioval; lip simple, acute, margin of the columella dilated above, reflexed.

Hab. Lahaina.—Bald.

VII.

Section **NEWCOMBIANA** Pfeiffer.

1. Shells from Molokai.

NEWCOMBIANA GROUP.

225. Achatinella newcombiana Pfeiffer.

Bulimus newcombianus Pfr. P. Zool. Soc. London, 1851, p. 261.

B. testa sinistrorsa, vix subperforata, ovato-turrita, tenuiuscula, plicis validis longitudinalibus sulcisque spiralibus sculpta, olivaceo-fusca; spira turrita, gracili, obtusula; anfractibus 5 1-2, summis planis, sequentibus convexiusculis, ultimo 3-7 longitudinis subaequante, medio inflato; columella callosa, substricte recedente; peristomate recto, acuto, margine externo leviter arcuato, subrepando, columellari reflexo, subappresso. Long. 14 1-2, diam. 5 1-2 mill.

Shell sinistral, scarcely subperforate, ovate-turreted, somewhat thin, marked with strong longitudinal folds and spiral sulcations, olive-brown; spire turreted, slender, somewhat obtuse; whorls 5 1-2, the upper flat, the following somewhat convex, the last nearly equal to 3-7 of the length, with the middle inflated; columella thickened, constricted below; lip erect, acute external margin lightly curved, slightly turned back, columellar margin reflexed, subappressed.

Hab. Kaluaaha.—Bald.

This species is nearly allied to *A. plicata*.—Bald.

226. Achatinella pfeifferi Newcomb.

A. pfeifferi Newc. P. Zool. Soc. London, 1853, p. 150, pl. xxiv, fig. 58.

Shell sinistral, acuminate, turreted, whorls 6, flatly convex; suture deep; aperture oblong-ovate; columella plain and smooth; outer lip simple; surface irregularly cut up into furrows, ridges and tubercles by deep longitudinal sulcations, crossed by strongly developed transverse striæ; color brown, with white longitudinal line on the upper whorls. Long. 14/20, lat. 4/20 poll.

Hab. Molokai.

Baldwin places this with *newcombiana* Pfr.

PHILIPPIANA GROUP.

227. Achatinella philippiana Pfeiffer.

A. philippiana Pfr. Malak. Blatt. iv, 1857, p. 89.

T. sinistrorsa, subimperforata, fusiformi-turrita, tenuiuscula, longitudinaliter striata et striis confertis spiralibus subundulatis decussata, fusca; spiro gracilis, apice acutiuscula; sutura marginata; anfr. 6, supremi plani, corneo et albo strigati, ultimus convexior, 2-5 longitudinis subaequans; columella subsimplex, non plicata; apertura obliqua, angulato-semiovalis; perist. simplex, rectum, marginibus callo tenuissimo junctis, externo fusculo limbato, columellari superne dilatato, subadnato. Long. 15-15 1-2, diam. 6 mill.

Shell sinistral, subimperforate, fusiform-turreted, quite thin, longitudinally striated and decussated with close spiral wavy lines, brown; spire slender, apex somewhat acute; suture marginate; whorls 6, the upper flat, striped with horn color and white, the last more convex, nearly equal to 2-5 of the length; columella quite simple, not plicate; aperture oblique, angulate-semioval; lip simple, erect, with margins joined by a very thin callus, external margin edged with brownish, margin of the columella dilated above, subadnate.

Hab. Makaknpaia.—Bald.

228. Achatinella cinnamomea Pfeiffer.

A. (newcombia) cinnamomea Pfr. P. Zool. Soc. London, 1858, p. 22.

T. imperforata, sinistrorsa, fussiformi-turrita, solidula, opaca, longitudinaliter plicatula, spiraliter sublirata et brevissime granulata, cinnamomea; spira elongata, subrectilinearis, apice acutiuscula; sutura subsimplex; anfr. 6 vix convexiusculi, superi fusco et albido marmorati, ultimus 2-5 longitudinis subaequans, infra medium attenuatus, castaneus; columella simplex, recedens; apertura parvum obliqua, semiovalis, basi subangulata; perist. simplex, rectum, acutum. Long. 19, diam. 5 mill.; ap. 7 2-3 mill., longa. 3 lata.

Shell imperforate, sinistral, fusiform-turreted, somewhat solid, opaque, longitudinally plicate, somewhat spirally lirate and very shortly granulate, yellowish-brown; spire elongate, subrectilinear, apex somewhat acute; suture quite simple; whorls 6, scarcely convex, the upper mottled with white and brown, the last nearly equal to 2-5 of the length, attenuate below the periphery, chestnut; columella simple, receding; aperture hardly oblique, semioval, slightly angled at the base; lip simple, erect, acute.

Hab. Mapulehu.—Bald.

229. Achatinella perkinsi Sykes.

Newcombia perkinsi Sykes. P. Malac. Soc. London, ii, 1896, p. 130.

T. sinistrorsa, anguste perforata, elongata-fusiformis, solida, cineraceo-fusca, striis vel strigis fuscis fulgurantibus eleganter picta; spira gracilis apice obtuso, laevi; anfr. 6 1-2, planiusculi, ultimus 1-2 altitudinis testae

subæquans; sutura marginata; columella subplicata; apertura parum obliqua, semiovalis, basi subangulata; peristoma simplex, margine columellari superne dilatato, adnato. Alt. 25, diam. max. 7.5 mm., apert. alt. 7.5, lat. 4 mm.

Shell sinistral, narrowly perforate, elongate-fusiform, solid, ashy-brown, elegantly colored with shining brown striæ or stripes; spire slender, apex obtuse, smooth whorls 6 1-2, somewhat flat, the last nearly equal to 1-2 of the length; suture marginate; columella subplicate; aperture hardly oblique, semioval, subangulated at the base; lip simple, dilated above the margin of the columella, adnate.

Hab. Molokai mountains.

This species is said to be larger and more solid than *A. philippiana* Pfr., and of a lighter color.

PLICATA GROUP.

230. Achatinella plicata Mighels.

A. plicata Migh. Rve. Icon. Conch. London, 1850, pl. vi, fig. 44.

Shell accuminately turreted, slender, rather thin, sinistral, whorls six in number, convex, sculptured throughout with numerous sharp spiral keels, sutures rather excavated, columella callous, plait obsolete, aperture small, lip simple; brownish-white, obscurely waved at the apex.

Hab. Kalae.—Bald.

231. Achatinella gemma Pfeiffer.

A. (newcombia) gemma Pfr. P. Zool. Soc. London, 1858, p. 22.

T. subimperforata, sinistrorsa, oblongo-turrita, solidiuscula, striatula et spiraliter lirata (liris planiusculis, conferte sulcatis), alba; spira turrita, apice acutiuscula; sutura submarginata; anfr. 7, superi plani, obsolete fusco, variegati, sequentes convexiusculi, ultimus 2-5 longitudinis subæquans-medio lira acutiore subcarinatus; columella leviter plicata; apertura parum obliqua, obauriformis; perist. subsimplex, margine columellari subreflexo, externo expansiusculo. Long. 17, diam. 6 1-2 mill.; ap. 7 mill., long 3 lata.

B. Fulvo-lutescens, anfractibus superis saturato corneo-strigatus.

Shell subimperforate, sinistral, oblong-turreted, somewhat solid, slightly striate and spirally lirate (liræ somewhat flat, closely sulcate), white; spire turreted, apex somewhat acute; suture submarginate; whorls 7, the upper flat, obsoletely maculated with brown, the following somewhat convex, the last nearly equal to 2-5 of the length, subcarinate at the periphery with a rather acute

lira; columella lightly plicate; aperture hardly oblique, obauriform; lip quite simple, columellar margin subreflexed, external margin somewhat expanded.

B. Brownish-yellow, striped on the upper whorls with dark horn color.

Hab. Hawaiian Ids.—Frick.

Equals *A. plicata* Migh.

232. Achatinella sulcata Pfeiffer.

A. sulcata Pfr. P. Zool. Soc. London, 1858, p. 22.

T. subperforata sinistrorsa, oblongo-turrita, solidula, striatula et liris confertis, in anfr. superioribus compressis, tum rotundatis cincta, castanea, nitidula; spira regularita attenuata, apice acutiuscula; sutura subsimplex; anfr. fere 6 planiuscula, supremi albo-flammulati, ultimus 2-5 longitudinis subaequans, basi saccatus, saturatius castaneus; columella levissime plicata; apertura obliqua, acuminato-ovalis; perist. tenue, margine columellari superne dilatato, reflexo, externo expansiusculo. Long. 12 1-2, diam. 5 2-5 mill.; ap. 5 2-3 mill. longa, 3 1-3 lata.

Shell subperforate, sinistral, oblong-turreted, somewhat solid, slightly striated and encircled with close liræ, in the upper whorls compressed, then rotundate, chestnut, somewhat shining; spire regularly attenuate, apex somewhat acute; suture quite simple; whorls nearly 6, almost flat; the upper white-flammulate, the last nearly equal to 2-5 of the length, base saccate, dark chestnut; columella very lightly plicate; aperture oblique, acuminate-ovate; lip thin, columella margin dilate above, reflexed, external margin somewhat expanded.

Hab. Pohakupili.—Bald.

Nearly related to *A. plicata* Migh.

233. Achatinella canaliculata Baldwin.

A. canaliculata Bald. P. Ac. Phila., 1895, p. 226, pl. x, figs. 28, 29.

Shell sinistral, very minutely perforated, somewhat solid, acuminately turreted, apex subacute; surface sculptured throughout with numerous acute spiral keels, which become blunter as they approach the apex, the interstices between the keels exhibiting under a lens very delicate growth striæ. Color brown, upper whorls tessellated with brown and white. Whorls 6, slightly convex, lower ones somewhat flattened at the base; suture lightly impressed; aperture oblique, oval, livid white or light brown within; peristome acute, very lightly thickened within, expanded, columellar margin reflected over the small perforation, margined with light brown on both face and the reverse; columella very slightly developed, plain and smooth. Length 14, diam. 6 1-2 mill.

Animal when extended in motion as long as the shell. Mantle slate color margined with brown. Foot light slate, studded on the side and head above with spots of deeper shade. Tentacles short and slender, dark slate.

The nearest allied species is *A. sulcata* Pfr., from which it may be distinguished by its small size and more acute keels; The animals also differ and the habitats are widely separated.—Bald.

Hab. Halawa.—Bald.

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2. Shells from Maui.

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234. Achatinella cumingii Newcomb.

A. cumingii Newc. P. Zool. Soc. London, 1853, p. 150, pl. xxiv, fig. 59.

Shell sinistral, acuminate, turreted; whorls 6, margined above, planulate; suture moderately impressed; aperture oblong-ovate; columella slightly callous; outer lip thin, elliptical; numerous striæ, obliquely transverse and well marked, traverse the entire shell, with longitudinal incremental striæ more or less developed; color brown, with obsolete white undulations on the superior whorls. Long. 16/20, lat. 4/20 poll.

This species, with the preceding, form, with the *A. plicata* of Mighels, a group of an excentric and extremely interesting type. —Newc.

Hab. Haleakala.—Newc.

VIII.

Section **AMASTRA.**—H. & A. Adams.

1. Shells from Oahu. A.—Main mountain ridge.

235. Achatinella tristis Férussac.

A. tristis Fér. Rve. Conch. Icon. Achat., London, 1850, pl. v, fig. 37.

Shell globosely ovate, rather solid, dextral, spire short, acute at the apex, whorls convex, columella arched, with a twisted plait; yellowish-cream color or brownish, covered with a black fugacious epidermis, apex brown-red.

Hab. Nuuanu to Palolo.—Bald.

236. Achatinella fuliginosa Gould.

A. fuliginosa Gld. P. Boston Soc., ii, 1848, p. 28.

T. imperforata, ventricoso-ovata, apice acuta, tenui, pallide virescente, epidermide nigricante induta; anfr. 6, supra subtabulatis, striis incrementi, et striis volventibus inequalibus decussatis; apertura parva, semilunari; latro simplici intus incrassato, fauce cærulescente; plica acuta. Long. 7-10, lat. 2-5 poll.

Shell imperforate, ventricose-ovate, apex acute, thin, pale greenish, covered with a blackish epidermis; whorls 6, nearly flat, unequally decussate with lines of growth and revolving striæ; aperture small, semilunate; lip simple, thickened within, aperture bluish; fold acute.

Hab. Nuuanu to Palolo.—Bald.

This shell is generally placed with *A. tristis* Fér.

237. Achatinella ventulus Férussac.

A. ventulus Rve. Rve. Icon. Conch., London, 1850, pl. iv, fig. 31.

Shell oblong, cylindrical, dextral, whorls flatly convex, very finely impressed striated, columella short, arched, thinly twisted-plaited; aperture small; very dark brown, with a pale band beneath the sutures, covered with a slight epidermis, interior of aperture bluish.

Animal intensely black; superior tentacles rather long; bottom of foot and mantle very light gray; motions quite lively.—Newc.

This shell in the Imperial Museum is a dead and worn specimen, but its identity with *melampoides* could not be mistaken. —Newc.

Hab. Nuuanu to Palolo.—Bald.

238. Achatinella melampoides Pfeiffer.

A. melampoides Pfr. P. Zool. Soc. London, 1851, p. 262.

A. testa oblonga, solida, rugulosa-striata, vix nitidula, saturate fusca; spira convexo-conica, acutiuscula; sutura impressa, submarginata; anfr. 6, vix convexiusculis, ultimo spira paulo breviore, basi rotundato; apertura verticali, sinuato-ovali; perist, recto, acuto, intus labiato, margine columellari calloso, albo, appresse reflexo. Long. 13, diam. 5 2-3 mill.

Shell oblong, solid, roughly striated, scarcely shining, dark brown; spire convexly conical, somewhat acute; suture impressed, submarginate; whorls 6, scarcely convex, the last a little shorter than the spire, rotundate at the base; columella with an acute tubercle; aperture vertical, sinuately oval; lip erect, acute, thickened within, columellar margin callous, white, appressed, reflexed.

Hab. Palolo to Nuuanu.

This equals *A. ventulus* Fér.

239. Achatinella turritella Férussac.

A. gravida Fér. Hist. Moll., Paris, 1820-1851. ii, pt. 2, p. 196, pl. clv, fig. 13.

A. testa solidula, longitudinaliter striata, rugosa, apice obtusiuscula, rufa; anfractibus septem convexis, ultimo 1-3 longitudinis æquante; apertura ovali; columella torta, lilacina, basi appendicula dentiformi instructa; peristomate simplici, margine columellari nitido, reflexiusculo. 18×8 mm.

Shell somewhat solid, longitudinally striate, rough, apex somewhat obtuse, red; whorls 7, convex, the last equal to 1-3 of the length; aperture ovate; columella twisted, lilac, furnished with a small tooth-like appendage at the base; lip simple, margin of the columella shining, reflexed.

Hab. Palolo to Kalihi.

240. Achatinella oahuensis Green.

Achatin oahuensis Green. Stewart's Jour., London, 1828, p. 407.

Shell dextral, oblong; about 3-4 of an inch in length, and 1-4 of an inch in diameter; whorls 7-8, slightly rounded; sutures deeply impressed and crenulated; periostracha finely striated, and of a light dirty reddish-brown colour; body whorled with an obso-

lete carina; apex chestnut colour; columella plaited, as in *A. stewartii;* outer lip thin; inside pinkish, darker near the edge.

Hab. Palolo near Nuuanu.

This equals *A. turritella* Fér.

241. Achatinella inornata Mighels.

A. inornata Migh. P. Boston Soc., ii, 1845, p. 21.

Shell dextral, elevated, turreted, sometimes straw-colored, sometimes dark brown, unadorned, perforate; whorls 7, convex; aperture subovate; lip simple, acute. Length 3-4, diam. 3-10.

Hab. Kalihi to Palolo.—Bald.

This seems to be the same as *A. turritella* Fér.

242. Achatinella breviata Baldwin.

Amastra breviata Bald. P. Ac. Phil., 1895, p. 231, pl. xi, figs. 45, 46.

Shell dextral, very minutely perforated, rather thin, globosely conical; apex rather acute; surface not polished, covered with fine incremental lines, the nuclear whorls smooth; color corneous-brown, destitute of an epidermis; whorls 6, slightly convex; suture well impressed; aperture a trifle oblique, oval, livid white within; peristome simple, thin, extremities abruptly terminating in a thin lamellar plait. Length 12 1-2, diam. 7 1-2 mm.

Hab. Palolo and Halawa.

243. Achatinella vetusta Baldwin.

Amasta vetusta Bald. P. Ac. Phil., 1895, p. 233, pl. xi, fig. 50.

Shell fossil, dextral, imperforate, solid, ovately conical, apex rather acute; surface sculptured with somewhat regular, close rib-striæ in the direction of the growth lines, with a few faint cross lines; the embryonic whorls radiately sulcated; color of living shell unknown; whorls 6 1-2, very slightly convex; suture lightly impressed; aperture sinuately oval, a little oblique; peristome flatly blunt, thickened on the inner edge, margins united with a thick calosity; columella flexuous, abruptly terminating in a small, thin plait. Length 13, diam. 7 1-2 mm.

Hab. Near Honolulu.

244. Achatinella rubicunda Baldwin.

Amastra rubicunda Bald. P. Acad. Phil., 1895, p. 229, pl. xi, fig. 38.

Shell dextral, imperforate, rather solid, elongately ovate-conic; surface lustreless, striated with irregular growth striæ;

embryonic whorls smooth; color reddish, with traces of a deciduous, thin, brown epidermis; whorls 7, slightly convex; suture well impressed; aperture elongately oval, a trifle oblique, rather small, purplish red within; peristome simple, thin, margined with dark purple; columella white with a purple tinge, flexuous, abruptly terminating in a thin, slightly curved lamellar plait. Length 19, diam. 9 mm.

Hab. Konahuanui Mt.

245. Achatinella textilis Férussac.

Helix (*Helicteres*) *textilis* Fér., Voy. Freycinet, Zool., p. 482.

Testa dextrorsa, ovata, vertice acuminata, striis longitudinalibus et transversalibus cælata; epidermide luteo vel rufo-fugaci; anfractibus 5; apertura semilunata; peristomate intus incrassato; columella brevi, costa distincta munita; rima umbilicali vix distincta.

Longeur, six lignes deux tiers; diametre, trois lignes trois quarts.

Shell dextral, ovate, apex acuminate, engraved with longitudinal and transverse striations, epidermis yellow or fugitive red; whorls 5; aperture semilunate; lip thickened within; columella short, furnished with a distinct fold; umbilical cleft scarcely distinct.

246. Achatinella microstoma Gould.

A. microstoma Gld. P. Boston Soc., ii, 1845, p. 28.

T. ovata imperforata, solida, epidermide fusco-virescente; anfr. 6, ultimo ventricoso; apertura parva, ovato-rotundata, fauce livida; labro simplici, intus incrassato; columella profunde sinuosa, callo crasso obtecta; plica valida. Long. 3-5, lat. 7-20 inch.

Shell ovate, imperforate, solid, with a brownish green epidermis; whorls 6, with the last ventricose; aperture small, ovate-rotundate, bluish; lip simple, thickened within; columella strongly twisted, covered with a thick callus; fold strong.

Hab. Nuuanu and Kalihi.

Mr. Baldwin places this with *A. textilis* Fér.

247. Achatinella undata Baldwin.

Amastra undata Bald. P. Acad. Phil., 1895, p. 230, pl. xi, fig. 39.

Shell dextral, imperforate, solid, ovate; spire convexly conical, apex rather acute, base somewhat attenuated; surface lustreless, closely and rather evenly ribbed in the direction of the growth lines, nuclear whorls finely radiately sulcated with prominent ribstriæ; color light brown and dark chestnut, alternating in irregular longitudinal undulations; whorls 6, slightly convex; suture moderately impressed; aperture a trifle oblique, sublunate, rather

small, white within; peristome acute, slightly thickened within; columella white flexuous, abruptly terminating in a thin, slightly arched lamellar plait. Length 17, diam. 12 mm.

Hab. Nuuanu.

248. Achatinella badia Baldwin.

Amastra badia Bald. P. Ac. Phil., 1895, p. 230, pl. xi, fig. 40.

Shell dextral, imperforate, rather thin, elongately ovate-conic; surface shining, sculptured with delicate, rather close thread-like rib-striæ in the direction of the growth lines; embryonic whorls radiately sulcated; color dark chestnut-brown, with light brown zigzag or undulating lines and markings; whorls 6 1-2, slightly convex; suture moderately impressed; aperture oval, a trifle oblique, livid white within, showing the brown color of the exterior; peristome acute, very lightly thickened within; columella white, flexuous, abruptly terminating in a thin slightly arched lamellar plait. Length 20 1-2, diam. 10 1-2 mm.

Hab. Ewa.

249. Achatinella antiqua Baldwin.

Amastra antiqua Bald. P. Ac. Phil., 1895, p. 233, pl. xi, fig. 47.

Shell fossil, dextral, narrowly but deeply perforated almost to the apex; solid, elongately ovate, apex subacute; surface sculptured with rude irregular lines of growth, apical whorls smooth; color of living shell unknown; whorls 6, convex; suture well impressed; aperture a trifle oblique, sublunate; peristome thickened within, columellar margin adnate, slightly expanded over the umbilicus, extremities somewhat converging and united by a thick parietal callosity; columella flexuous, terminating in a narrow plait. Length 20, diam. 12 mm.

Hab. Ewa.

250. Achatinella peasei Smith.

Amastra peasei Sm. P. Zool. Soc. London, 1873, p. 86, pl. x, fig. 13.

Testa dextrorsa, globoso-ovato-conica, subperforata, nitidiuscula, incrementi lineis leviter striata, epidermide pertenui induta; anfract. 6, primi 4 fusco-rubescentes convexiusculi, penultimus magnus inflatus ultimusque palidiores; spira supra anfract. penult. subito in conum producta; sutura simplex; apertura parva, spiram non æquans, subquadrata, intus rubescens; perist. tenue; columella recta, leviter reflexa, rimam parvam fere tegens, plica tenui subbasali munita, labroque callo pertenui juncta. Long. 17, diam. 10 mill.

Shell dextral, globose-ovate-conic, subperforate, somewhat shining, lightly striate with lines of growth, covered by a very thin epidermis; whorls 6, the first 4 brown-reddish somewhat convex,

next to the last large, inflated and with the last paler; spire above the next to the last whorl suddenly extended into a cone; suture simple; aperture small, not equal to the spire, subquadrate, reddish within; lip thin; columella erect, lightly reflexed, almost covering a small cleft, furnished with a subbasal thin fold, and joined to the lip by a very thin callus.

Hab. ?

251. Achatinella nigrolabris Smith.

Amastra nigrolabris Sm. P. Zool. Soc. London, 1873, p. 85, pl. x, fig. 9.

T. dextrorsa, globoso-conica, perforata, parum nitida, longitudinaliter rugose (haud spiraliter) striata, saturate nigro-fusca, suturam infra zona lata dilute sordido-carnea cincta; anfract. 6 1-2, primi 3 1-2 subplani cœteri convexi; sutura haud marginata, apertura alba; perist. margine tenui nigro-purpureo, intus leviter, limbatum; columella rosea, plica laminæformi basali (et interdum tuberculis 1-2) munita. Long. 20, diam. 12 mill.

Shell dextral, globose-conic, perforate, hardly shining, longitudinally roughly (not spirally) striated, dark black-brown, encircled below the suture with a broad, pale, dirty, flesh-colored band; whorls 6 1-2, first 3 1-2 somewhat flat, the rest convex; suture not marginate; aperture white; the thin margin of the lip black-purple, lightly thickened within; columella rose, furnished with a lamina-like basal fold (and sometimes with 1–2 tubercles).

Affinities. It is allied to *Am. spirizona* Fér., which is confined to another range of mountains, is found almost exclusively on the ground, and has a spire somewhat convex, while this is regularly conical.—Sm.

Remarks. This species is invariably dextral.—Sm.

Hab. The metropolis of the species is Wahiawa. It is also found in all the valleys from Kalaikoa to Waimea.

252. Achatinella rudis Pfeiffer.

A. rudis Pfr. P. Zool. Soc. London, 1855, p. 5, pl. xxx, fig. 17.

A. testa subimperforata, ovato-turrita, solida, ruditer striata, fulvo-fusca; spira elevato-conica, acutiuscula; sutura simplice, levissime crenulata; anfr. 7 1-2, modice convexis, ultimo 2-5 longitudinis vix formante, rotundato; apertura obliqua, sinuato-ovali; plica columellari mediana, laminæformi, subtransversa; perist. simplice, recto, acuto, margine columellari dilatato reflexo, subadnato. Long. 21, diam. 11 1-2 mill.

B. castanea, fascia mediana et basi lutescentibus, spira minus elongata.

Shell subimperforate, ovate-turreted, solid, roughly striate, yellowish brown; spire elongate-conic, somewhat acute; suture simple, very lightly crenulate; whorls 7 1-2, moderately convex, the last hardly forming 2-5 of the length, rotundate; aperture oblique, sinuately oval; columellar fold median, lamelliform, sub-

transverse; lip simple, erect, acute, with the columellar margin dilated, reflexed, subadnate.

Hab. Wahiawa.

Mr. Baldwin places this with *A. nigrolabris* Pfr. It is also closely related to *A. spirizona* Fér. from the opposite range of mountains.

253. Achatinella decorticata Gulick.

A. decorticata Gk. P. Zool. Soc. London, 1873, p. 84, pl. x, fig. 14.

T. ovato-conica, dextrorsa, incrementi lineis leviter striata, castanea, labrum versus nigrescens; anfract. 6–6 1-2, convexiusculi, primi 3 politi; sutura simplex, palida; apertura intus dilute sordido-cærulea; perist. tenue intus nigrescens, vix incrassatum; plica columellaris tenuis. Long. 16, diam. 8 1-2 mill.

Shell ovate-conic, dextral, lightly striate with lines of growth, chestnut, blackish toward the lip; whorls 6–6 1-2, somewhat convex, first three polished; suture simple, pale; aperture light dirty blue within; lip narrowly blackish within, scarcely thickened; columellar fold thin.

Affinities. It is allied to *Am. elliptica* Gk., the metropolis of which lies to the northwest of this, and to *Am. inflata* Pfr., which is found in the valleys to the east.—Gk.

Remarks. It is always dextral. The specimen figured is from Kawailoa.—Gk.

Hab. The metropolis of the species is Kawailoa. It is also found in Helemano, Opaiula, Waimea, Waialee and Kahuku.

254. Achatinella elliptica Gulick.

Amastra elliptica Gk. P. Zool. Soc. London, 1873, p. 83, pl. x, fig. 15.

T. dextrorsa, ovata, haud nitida, incrementi lineis leviter striata; anfract. 5 1-2 convexi, primi 4 1-2 fusco-cornei, et ultimus pallidior, epidermide saturate olivacea (anfr. ult. antice partim detrita) vestiti; spira subturrita, sutura simplex; apertura alba, antice roseo tincta (interdum alba); perist. tenue, intus levissime incrassatum; columella arcuata, labro callo tenui juncta, dente compresso subbasali munita. Long. 15, diam. 8 1-2 mill.

Shell dextral, ovate, not shining, lightly striate with lines of growth; whorls 5 1-2 convex, first 4 1-2 brownish horn color, and the last lighter, covered with a dark olive epidermis (partly worn away on the upper portion of the last whorl); spire subturreted, suture simple; aperture white colored with rose above (sometimes white); lip thin, very lightly thickened within; columella curved, united to the lip by a thin callus, furnished with a subbasal compressed tooth.

Station. On the ground in the forest.

Affinities. It is allied to *Am. rubens* Gould, and *Am. decorticata* Gk., but it is thinner, smaller, and darker in color than the former, and has a more convex spire than the latter.—Gk.

Remarks, It is always dextral.—Gk.

Hab. The metropolis of the species is Waialee. It is also found in Kahuku and Hanula, and rarely in Kawailoa.

255. Achatinella inflata Pfeiffer.

A. (*Laminella*) *inflata* Pfr. P. Zool. Soc. London, 1855, p. 203.

A. testa imperforata, conico-globosa, subruditer striata albida, epidermide nigra infra suturam late fasciatim detrita obducta; spira inflata, in conum brevem, acutum terminata; anfr. 5 1-2, ultimis 3 perturgidis, ultimo spiram æquante; apertura obliqua, sinuato-ovali, intus alba; plica colum. subtransversa, alte ascendente, perist. recto, intus labiato, margine colum. dilatato, calloso, adnato. Long. 16 1-2, diam. 10 mill.

B. Minor, anfractu ultimo superne castaneo, basi pallido, vel coloribus obversis.

Shell imperforate, conic-globose, quite roughly striated, whitish, covered with a black epidermis, worn away in broad bands below the suture; spire inflated, terminating in a short cone, acute; whorls 5 1-2, the last 3 much inflated, the last equal to the spire; aperture oblique, sinuately oval, white within; columellar fold subtransverse, ascending, deep within, lip erect, thickened within, at the margin of the columella dilated, incrassated, adnate.

Hab. Koolauloa.—Bald.

256. Achatinella rubida Gulick.

Amastra rubida Gk. P. Zool. Soc. London, 1873, p. 84, pl. x, fig. 12.

Testa dextrorsa, elongato-ovata, incrementi lineis striata, dilute rubro-castanea (epidermide nigrescenti raro induta); anfract. 6, convexiusculi, primi 2 læves fusci; sutura simplex; apertura parva, intus subpurpurea; perist. tenue; plica columellaris tenuissima. Long. 18, diam. 9 mill.

Shell dextral, elongate-ovate, striated with lines of growth, pale reddish chestnut (rarely covered with a blackish epidermis); whorls 6, somewhat convex, first 2 light brown; suture simple; aperture small, nearly purple within; lip thin; columellar fold very thin.

Station. On the ground in the forest.

Affinities. It is allied to *Am. elliptica* Gk., but differs in being more elongate in form, thicker in structure, and for the most part destitute of epidermis.—Gk.

Hab. Kahuku.—Frick.

257. Achatinella transversalis Pfeiffer.

A. (*Laminella*) *transversalis* Pfr. P. Zool. Soc. London, 1855, p. 204.

A. testa subrimata, ovato-conica, solida, confertim striata, lineis spiralibus impressis distantibus subdecussata, nigro-rufa, epidermide fulvo-grisea,

guttatim et fasciatim interrupta, obducta; spira inflato-conica, acuta; anfr. 6 convexiusculis, ultimo 2-5 longitudinis subæquante; apertura parum obliqua, sinuato-ovali; plica colum. lamæformi, subbasali, fere transversa; perist. recto, intus albido vel roseo tenuiter labiato. Long. 12, diam. 6 mill.

Shell subperforate, ovate-conic, solid, closely striated, subdecussate with impressed distant spiral lines, black-red, covered with a brown-gray epidermis, broken up by spots and bands; spire inflated-conic, acute; whorls 6 slightly convex, the last nearly equal to 2-5 of the length; aperture hardly oblique, sinuately oval; columellar fold laminella-like, subbasal, almost transverse; lip erect, narrowly edged within with white or rose.

Hab. Keawaawa.—Bald.

258. Achatinella luctuosa Pfeiffer.

A (*Laminella*) *luctuosa* Pfr. P. Zool. Soc. London, 1855, p. 204.

A. testa imperf., dextr., oblongo-conica, solida, striatula, nitidula, bicolore; spira inflato-conica, apice acuta; sutura crenulata; anfr. 6, summis 4 nigris, subplanis, penultimo pallido, convexiore, ultimo 2-5 longitudinis subæquante, superne pallide fulvescente, infra peripheriam nigricante; apertura parum obliqua, sinuato-semiovali, intus alba; plica colum. laminæformi, subbasali, triangulari; perist. recta, acuto, nigro-limbato. Long. 16, diam. 8 mill.

Shell imperforate, dextral, oblong-conic, solid, somewhat striated, slightly shining, bicolored; spire inflated-conic, apex acute; suture crenulate; whorls 6, the 4 upper black, nearly flat, the next to the last pale, more convex, the last nearly equal to 2-5 of the length, pale brownish above, below the periphery blackish; aperture scarcely oblique, sinuately semioval, white within; columellar fold laminalike, subbasal, triangular; lip erect, acute, edged with black.

Hab. Waialee.—Bald.

259. Achatinella sericea Pfeiffer.

A. (*Laminella*) *sericea* Pfr. P. Zool. Soc. London, 1859, p. 31.

T. imperforata, dextrorsa, ovato-conica, solida, subruditer striata, striis spiralibus minute granulato-decussata, serica, saturate brunnea; spira convexo-conica, acutiuscula; anfr. fere 6 convexi, ad suturam pallidiores, ultimus 2-5 longitudinis æquans, circa columellam albidus; columella lamina compressa, brevi, obliqua munita; apertura obliqua, elliptica; perist. simplex, rectum, margine dextro fere semicirculari, cum columellari calloso angulatim juncto.

Shell imperforate, dextral, ovate-conic, solid, somewhat roughly striated, minutely granulately decussate with spiral lines, silky, dark brown; spire convexly conic, somewhat acute; whorls almost 6 convex, paler at the suture, last equal to 2-5 of the length, whitish about the columella; columella furnished with a compressed,

short, oblique fold; aperture oblique, elliptical; lip simple, erect, dextral margin almost semicircular, forming an angle with the columellar fold.

Hab. Waialua(?).—Bald.

260. Achatinella porphyrostoma Pease.

A. porphyrostoma Pease. J. Conchyl., 1869, p. 172.

T. dextrorsa, imperforata, crassa, elongato-conica, rugoso-striata; sub epidermide fusca, rugosa, densa, flavescens; spira convexo-conica; anfr. 6, convexi, ultimus subinflatus, 1-2 longitudinis testæ æquans; sutura bene impressa; apertura subelliptica, ad basin subangulata; columella recta, plica columellaris laminæformis, crassa, fere transversa; perist. simplex; columella labroque purpurascentibus; apice rubenti-fusco.

Shell dextral, imperforate, thick, elongate-conic, rugose-striated; under the brown epidermis rugose, thick, brownish; spire convex-conic; whorls 6, convex, the last subinflated, equal to 1-2 the length of the shell; suture well impressed; aperture subelliptical, subangulated at the base; columella erect, columella fold laminalike, thick, almost transverse; lip simple; columella and lip purplish; apex red-brown.

Hab. ?

261. Achatinella solida Pease.

Amastra solida Pse. J. Conchyl. xvii, 1869, p. 173.

T. dextrorsa, imperforata, crassa, elongato-ovata; anfr. 6, convexi, ultimus vix inflatus, interdum ad basin rotundato-angulatus, 1-2 longitudinis testæ haud æquans; apertura late elliptica, ad basin subangulata; plica columellaris crassa, subbasalis, fere transversa; perist. rugosum, callosum, marginibus callo crassa junctis; castaneo-fusca, apice rubenti-fusco; apertura albida. Long. 15, diam. 8 mill.

Shell dextral, imperforate, thick, elongate-ovate; whorls 6, convex, the last hardly inflated, sometimes rotundate-angulate at the base, hardly equal to 1-2 the length of the shell; aperture broadly elliptical, subangulated at the base; columella fold thick, subbasal, almost transverse; lip rugose, thickened, with the margins joined by a thick callus; chestnut-brown, apex reddish-brown; aperture whitish.

Hab. ?

262. Achatinella subrostrata Pfeiffer.

A. (*Laminella*) *subrostrata* Pfr. P. Zool. Soc. London, 1859, p. 31.

T. imperforata, dextrorsa, ovato-conica, solida, irregulariter striata, nitidula, fusca, fulvo-nebulosa; spira ventroso-conica, apice acutiuscula; anfr. 6, superi 4 vix convexiusculi, ultimus rotundatus, 2-5 longitudinis subæquans; lamina columellaris fere basalis, acuta, obliqua; apertura vix ob-

liqua, irregulariter semielliptica, ad columellam angulata, quasi in rostrum producta; perist. rectum, intus albolabiatum, margine dextro subrepando, columellari parum dilatato, adnato. Long. 15, diam. 8 mill.

Shell imperforate, dextral, ovate-conic, solid, irregularly striated, somewhat shining, brown, blotched with tawny; spire ventrose-conic, apex somewhat acute; whorls 6, the upper 4 hardly convex, the last rotundate, nearly equal to 2-5 of the length; columellar fold almost basal, acute, oblique; aperture hardly oblique, irregularly semielliptical, angulate at the columella, extending somewhat like a beak; lip erect, thickened with white within, dextral margin slightly reflexed, scarcely dilated at the columella, adnate.

Hab. ?

263. Achatinella tenuilabris Gulick.

Amastra tenuilabris Gk. P. Zool. Soc. London, 1873, p. 83, pl. x, fig. 16.

Testa dextrorsa, ovato-conica, haud nitens, incrementi lineis subrugose striata, sub epidermide fulvida (in anfract. ult. infra suturam plerumque detrita) alba; anfract. 5 1-2, convexiusculi; apertura subquadrata, alba spiram nonæquans; perist. tenue; columella recta, plica parva medio munita, labro callo tenuissimo juncta. Long. 15, diam. 8 mill.

Shell dextral ovate-conic, scarcely shining, almost roughly striate with lines of growth, tawny under the epidermis (often on the last whorl worn away below the suture), white; whorls 5 1-2, somewhat convex; aperture subquadrate, white, not equal to the spire; lip thin; columella erect, furnished at the middle with a small fold, joined to the lip by a thin callus.

Hab. ?

It is doubtful where to place this shell. Mr. Gulick says it may be allied to *A. flavescens* Newc., found on the Island of Hawaii.

264. Achatinella conicospira Smith.

Amastra conicospira Sm.. P. Zool. Soc. London, 1873, p. 86, pl. x, fig. 10.

Testa ovato-conica, dextrorsa, incrementi lineis striata, sordide albida, epidermide olivacea partim induta; anfract. 7, planiusculi, primi 3–4 dilute rubescentes, sequentes 2 fusco-purpurascentes; spira recte conica; sutura simplex; apertura sordide alba; perist. tenue, intus fuscescens, haud incrassatum; plica columellaris tenuis. Long. 20 1-2, diam. 10 mill.

Shell ovate-conic, dextral, striate with lines of growth, dirty white, partly covered with an olive epidermis; whorls 7, somewhat flat, first 3–4 pale reddish, the following 2 brown-purple; spire exactly conical; suture simple; aperture dirty white; lip thin, brownish within, scarcely thickened; columellar fold thin.

Hab. ?

B. Waianae Mountain Shells.

265. Achatinella spirizona Férussac.

Achatina spirizona Fér. Hist. Moll., ii, pt. 2, p. 196, pl. clv, figs. 14, 15.

A. testa ovato-acuta, longitudinaliter striata, nigricanti brunnea, fascia carnea vel fulvida ad suturam ornata; spira conico-acuta; anfractibus septem planiusculis, lente accrescentibus, ultimo inflato, 2-5 longitudinis vix superante, angusto, angulo antice evanescente; apertura oblongo-ovali, intus livida; peristomate simplici, acuto; columella medio plica acuta, contorta, lamelliformi, albida instructa. 24×13 mill.

Shell ovate-acute, longitudinally striate, blackish brown, ornamented at the suture by a flesh-colored or tawny band; spire conic-acute; whorls seven somewhat flat, slowly increasing, the last inflated, scarcely more than 2-5 of the length, contracted, with an angle disappearing antically; aperture oblong-ovate, bluish within; lip simple, acute; columella furnished at the middle with an acute, twisted lamelliform, whitish fold.

Hab. Mt. Kaala.

266. Achatinella acuta Swainson.

A. acuta Swain. Zool. Ill., iii, p. 99, fig. 3, 1832.

A. testa ovato-oblonga, castanea, fascia marginali fulva; spira longiuscula, apice acuto, nigro.

Shell ovate-oblong, chestnut, with a marginal fulvous band; spire somewhat lengthened, acute, the tip black.

Shell somewhat pyriform; the spire being pointed, and considerably longer than the aperture. The colour is a deep reddish chestnut, the suture having a marginal band of fulvous white, but without any groove. The apex is blackish, the pillar twisted, and but slightly thickened.

Hab. Mt. Kaala.

Dr. Newcomb places this with *A. spirizona* Fér.

267. Achatinella chlorotica Pfeiffer.

A. chlorotica Pfr. P. Zool. Soc. London, 1855, p. 203.

A. testa subperforata, ovato-conica, solida, ruguloso-striata, albida, epidermide virente strigatim variegata; spira conica, acutiuscula, anfr. 6, superis convexiusculis, penultimo turgido, ultimo 2-5 longitudinis subæquante, rotundo; apertura obliqua, truncato-ovali, intus alba; plica colum. supera, levissima, fere nulla; perist. simplice, recto, margine colum. parum dilatato, sublibero. Long. 18, diam. 10 1-2 mill.

Shell subperforate, ovately conical, solid, roughly striated, whitish, poorly variegated with a greenish epidermis; spire conic, somewhat acute; whorls 6, the upper slightly convex, the penultimate inflated, the last nearly equal to 2-5 of the length, rotundate; aperture oblique, truncately oval, white within; columellar fold high, very minute, almost obsolete; lip simple, erect, scarcely dilated at the margin of the columella, nearly free.

Hab. Mt. Kaala.

This is the same as *A. spirizona* Fér.

268. Achatinella albida Pfeiffer.

A. albida Pfr. P. Zool. Soc. London, 1855, p. 203.

A. testa perforata, ovato-turrita, tenui, irregulariter striata, albida, epidermide pallide fulvescente strigulata; spira conica, apice acutiuscula; sutura levissime crenulata; anfr. 6, superis planis, sequentibus convexioribus, ultimo 2-5 longitudinis vix æquante, rotundato, peripheria obsolete subangulato; apertura parum obliqua, sinuato-ovali; plica colum. mediana, laminæformi, obliqua; perist. simplice, recto, margine colum. breviter reflexo, sublibero. Long. 17, diam. 9 1-2 mill.

Shell perforate, ovately turreted, thin, irregularly striate, whitish, striped with a pale tawny epidermis; spire conic, apex somewhat acute; suture very lightly crenulate; whorls 6, the upper flat, the next more convex, the last scarcely equal to 2-5 of the length, rotundate, obsoletely subangulated at the periphery; aperture hardly oblique, sinuately oval; columellar fold median, lamelliform, oblique; lip simple, erect, columellar margin shortly reflexed, nearly free.

Hab. Mt. Kaala.

Mr. Baldwin places this with *A. spirizona* Fér.

269. Achatinella intermedia Newcomb.

A. intermedia Newc. P. Zool. Soc. London, 1853, p. 135, pl. xxii, fig. 13.

Shell dextral, subcylindrical; whorls 7, rounded; suture rather deep; aperture small subovate; columella with a small flexuous plait; lip acute; striæ numerous, well developed and longitudinal through the shell; color uniform dark brown, usually lighter at the suture, interiorly of a bluish white or slate color; columella bluish white. Long. 14/20, lat. 7/20 poll.

Hab. Under Mt. Kaala.

This shell is intermediate between *A. cylindrica* and the more cylindrical forms of *A. spirizona*.—Newc.

270. Achatinella cylindrica Newcomb.

A. cylindrica Newc. P. Zool. Soc. London, 1853, p. 134, pl. xxii, fig. 11.

Shell dextral, elongately cylindrical, tapering to a point at the summit; whorls 7, slightly rounded; suture moderate; aperture oblong-ovate; columella terminating in a flexuous tooth; surface of shell longitudinally strongly striate, of a light horn color, encircled with numerous small bands. Long. 16/20, lat. 6/20 poll.

This species, with the following, are found, like their nearest analogues, on the ground, viz.: *A. porphyrea* and *spirizona*, which latter species, by almost insensible gradations, passes into *A. turritella*, a shell apparently of quite a different type.—Newc.

Animal light gray, marbled with dusky triangular patches, mantle light gray, tentacles dark, granulations strong. A dorsal and two obscure lateral white lines extend from the head along the animal.—Newc.

Hab. Near Mt. Kaala.

271. Achatinella porphyrea Newcomb.

A. porphyrea Newc. P. Zool. Soc. London, 1853, p. 136, pl. xxii, fig. 16.

Shell rather solid, acuminately conical; whorls 7, subcarinated above, plano-convex; suture deeply impressed; aperture subovate, contracted below; lip thin; columella short, terminating in twisted plait; epidermis thin and black; striæ longitudinal and strong; color beneath epidermis of a leaden hue, with numerous transverse brown lines encircling the shell. Long. 15/20, lat. 8/20 poll.

This species belongs to the same group with *A. spirizona* Fér., *A. cylindrica* and *A. intermedia* Nob., but which are quite distinct in specific characters. They are all terrestrial, not arboreal species.—Newc.

Hab. Near Mt. Kaala.

272. Achatinella grossa Pfeiffer.

A. grossa Pfr. P. Zool. Soc. London, 1855, p. 204.

A. testa imperforata, dextrorsa, conico-ovata, solida, subruditer striata, castanea; spira ovato-conica, apice acuta, nigricante; sutura pallida crenulata; anfr. 7, summis planis, lævigatis, sequentibus sensim convexioribus, ultimo 2-5 longitudinis subæquante; apertura obliqua, sinuato-ovali, intus albida; plica colum. laminæformi, subtriangulari, fere transversa; perist. recto, acuto, marginibus callo albido junctis, dextro intus sublabiato, columellari adnato. Long. 23, diam. 11 mill.

Shell imperforate, dextral, conically ovate, solid, somewhat roughly striated, chestnut; spire ovately conic, apex acute, blackish; suture pale, crenulate; whorls 7, the upper flat, smooth, the

following gradually becoming more convex, the last nearly equal to 2-5 of the length; aperture oblique, sinuately semioval, whitish within; columellar fold laminiform, subtriangular, almost transverse; lip erect, acute, with the margins by a white callus, dextral margin somewhat thickened within, columellar margin adnate.

Hab. Near Mt. Kaala.

Mr. Baldwin places this with *A. porphyrea* Newc.

273. Achatinella crassilabrum Newcomb.

A. crassilabrum Newc. P. Zool. Soc. London, 1853, p. 141, pl. xxiii, fig. 31.

Shell conically ovate, pointed at the apex, ventricose below, solid; whorls 6, rounded; aperture ovate; lip very much thickened within; columella short, terminating in a strong oblique plait; longitudinal striæ strong, surface of the last whorl often marked with cicatrices; body whorl yellowish white, other whorls dark brown or black. Long. 12/20, lat. 6/20 poll.

Hab. Near Mt. Kaala.

274. Achatinella variegata Pfeiffer.

A. variegata Pfr. Zeitschr. für Malak. 1849, p. 90.

T. subperforata, solidula, oblongo-turrita, striata, fuscescenti-lutea, strigis epidermidis brunneæ variegata; spira turrita, apice rubescens, acutiuscula; sutura profunda, non marginata; anfr. 7 convexi, ultimus 2-5 longitudinis æquans; columella subbiplicata, plica infera transversa, compressa, lamelliformi, alba; apertura semiovalis; perist. simplex, rectum, acutum, margine columellari fornicato-reflexo, perforationem simulante. Long. 17, diam. 8 mill.; ap. oblique 7 mill. longa, medio 3 1-2 lata.

Shell subperforate, somewhat solid, oblong-turreted, striated, brownish-yellow, variegated with epidermal stripes of brown; spire turreted, apex reddish, somewhat acute; suture deep, not marginated; whorls 7 convex, the last equal to 2-5 of the length; columella subbiplicate, lower fold transverse, compressed, lamelliform, white; aperture semioval; lip simple, erect, acute, columellar margin arched-reflexed, similar to an umbilicus.

Hab. Waianae Valley.—Bald.

275. Achatinella decepta C. B. Adams.

A. decepta Adams. Contrib. to Conch., 1850, p. 127.

Shell rather thick, ovate-conic, much elongated; dingy white or very pale yellowish brown; with a dark brown or greenish epidermis, which is interrupted more or less in transverse stripes, and often terminates abruptly on the periphery of the last whorl; with irregular transverse striæ; without spiral striæ; apex subacute;

spire long, with outlines moderately curvilinear, whorls nearly 7 1-2, rather convex, with a well impressed suture; last whorl rather small; aperture small, ovate; lip sharp, not expanded, moderately thickened within; columellar fold moderately developed. Length .72, breadth .33 in.; length of ap. .25 in.

Hab. Waianae Valley.—Bald.

Mr. Baldwin places this with *A. varicgata* Pfr.

276. Achatinella rubens Gould.

A. rubens. P. Boston Soc., ii, 1845, p. 27.

Testa elongato-ovato, crassa, straminea, apice castanea, antice erubescente; anfr. 6, convexis, sutura impressa, epidermide fusco hic et illic obtectis; apertura ovata, labro simplici intus incrassato, rosaceo, fauce alba, plica tenui; imperforata. Long. 3-4, lat. 2-5 poll.

Shell elongately ovate, solid, straw color, apex chestnut, reddish ventrally, whorls 6, convex, suture impressed, here and there covered with a brownish epidermis; aperture ovate, lip simple, thickened within, rosy, further within white, columellar fold thin; imperforate.

A plain species but well marked by its colors, especially by that of the aperture.—Gould.

Hab. West mountains of Oahu.—Newc.

277. Achatinella cornea Newcomb.

A. cornea Newc. P. Zool. Soc. London, 1853, p. 141, pl. xxiii, fig. 32.

Shell irregularly acutely conical; the apex pointed; last whorl inflated; thin, corneous, with minute longitudinal striæ; whorls 7, rounded; aperture subovate; lip thin, translucent; columella straight, white and armed with a transverse plaited tooth; color uniform dark horn; columella and tooth white. Long. 10/20, lat. 5/20 poll.

Hab. Waianae Mts.—Bald.

278. Achatinella elongata Newcomb.

A. elongata Newc. Ann. Lyc. New York, vi, 1853, p. 26.
A. acuta Newc. P. Zool. Soc. London, 1853, p. 142, pl. xxiii, fig. 36.

Shell acutely turreted, sinistral; whorls 7, rounded; suture deep; striæ numerous, longitudinal and well defined; aperture ovate; lip simple; columella plicate; color of epidermis brown. Long. 10/20, lat. 4 1/2/20 poll.

But a solitary specimen of this shell has been found; but its characters are clearly marked, and no described species resembles it in form.

The two names for this species grew out of a change made by my friends in New York upon the publication of my paper, to avoid the repetition of a name by Swainson.

Believing that the cause of science would be subserved by illustrations of this with other species, I furnished, with some revision of the descriptions, a manuscript for the Zoological Society of London. The great distance of the Sandwich Islands prevented all corrections in the copy or proofs, hence the double name to the same species. The figure (plate 23, fig. 36) in the Zoological Proceedings is not of this shell, but is made from *A. soror*, and is the same as fig. 38 of the same plate. *A. acuta* is longer, and not so wide as this species.—Newc.

Hab. Lihue.—Newc.

279. Achatinella reticulata Newcomb.

A. reticulata Newc. P. Zool. Soc. London, 1853, p. 148, pl. xxiv, fig. 54.

Shell conically ovate; whorls 6, much rounded; suture moderate except at the junction of the last whorl, which is deep; aperture small, ovate; columella short with a plicate tooth, nearly transverse; color brown or chestnut, with white transverse lines and markings laid on to the epidermis in various patterns like lace work or embroidery. Long. 12/20, lat. 7/20 poll.

Hab. Mt. Kaala.

280. Achatinella conspersa Pfeiffer.

Achatinellastrum conspersa Pfr. P. Zool. Soc. London, 1855, p. 7, pl. xxx, fig. 26.

A. testa imperforata, dextrorsa, conico-ovata,, tenuiuscula, conferte striata, saturate fusca, maculis sordide albidis, strigas angulosus formantibus conspersa; spira convexo-conica, apice acuta; sutura simplice; anfr. 6, superis planiusculis, penultimo convexiore, ultimo 3-7 longitudinis subæquante, rotundato; apertura parum obliqua, sinuato-elliptica; plica columellari subbasali, compressa; perist. simplice, recto, margine columellari nullo. Long. 18, diam. 10 1-2 mill.

Shell imperforate, dextral, conic-ovate, somewhat thin, closely striated, dark brown, poorly spotted with white blotches, forming zigzag stripes; spire convex conic, apex acute; suture simple; whorls 6, the upper somewhat flat, the next to the last more convex, the last nearly equal to 3-7 of the length, rotundate; aperture hardly oblique, sinuate-elliptical; columellar fold subbasal, compressed; lip simple, erect, without columellar margin.

Hab. Near Lihue.

This approaches *A. reticulata* Newc.

281. Achatinella micans Pfeiffer.

A. (*Laminella*) *micans* Pfr. P. Zool. Soc. London, 1859, p. 31.

T. subperforata, dextrorsa, turrita, solidula, sub epidermide lutea, glutinoso-micante alba; spira regulariter attenuata, apice acutiuscula; sutura subcrenata; anfr. 7 convexiusculi, ultimus 1-3 longitudinis vix superans, rotundatus; lamina columellaris parvula, obliqua; apertura vix obliqua, subovalis; perist. simplex, rectum, margine columellari. Long. 16, diam. 7 2-3 mill.

Shell subperforate, dextral, turreted, somewhat solid, under the yellowish epidermis, white with a glutinous sheen, spire regularly attenuate, apex somewhat acute; suture slightly crenulate; whorls 7 somewhat convex, last barely more than 1-3 of the length rotundate; columellar fold small, oblique; aperture scarcely oblique, suboval; lip simple, erect, slightly dilated at the margin of the columella, nearly free.

Hab. Waianae Mts.

282. Achatinella albolabris Newcomb.

A. albolabris Newc. P. Zool. Soc. London, 1853, p. 149, pl. xxiv, fig. 56.

Shell conically ovate; apex acute; whorls 6, rounded, not margined; aperture ovate; columella short, plicately toothed; lip semilunar, thickened and white; color dark umber, with a yellow sutural line; within bluish white. Long. 14/20, lat. 6 1/2/20 poll.

We are compelled to separate this and another, the *A. reticulata*, from *A. nucleola* of Gould, from which they differ in important and permanent characters.

The shell figured by Mr. Reeve, though not a fine specimen, clearly belongs to this species. *A. nucleola* Gould is quite distinct, and is found on the island of Kauai, not Oahu, where this species is met with.—Newc.

Hab. Waianae.—Newc. Kapalama and Kalihi.—Bald.

283. Achatinella pellucida Baldwin.

Amastra pellucida Bald. P. Ac. Phil., 1895, p. 231, pl. xi, figs. 41, 42.

Shell dextral, imperforate, very fragile, thin, translucent, globosely conic, apex rather acute; surface lustreless, sculptured with fine incremental lines, apical whorls smooth; color light brown, apex darker; destitute of epidermis; whorls 5 1-2, somewhat convex; suture moderately impressed; aperture oval, a trifle oblique, livid-white within; peristome simple, thin; columella white, flexuous, abruptly terminating in a thin lamellar plait. Length 12 1-2, diam. 8 mm.

Animal of a uniform brown color; the head above and tentacles of a darker shade. The action of the heart is plainly visible through the thin texture of the shell.

Hab. Waianae Valley.—Bald.

284. Achatinella tenuispira Baldwin.

Amastra tenuispira Bald. P. Ac. Phil., 1895, p. 232, pl. xi, fig. 51.

Shell dextral, imperforate, solid, acuminately turreted, spire conical, apex subacute; surface lustreless, covered with somewhat rude, irregular incremental striæ; the embryonic whorls very finely radiately sulcated; color light brown, upper whorls darker; covered with an earthy brown, fugacious epidermis; whorls 7, somewhat convex, in some examples slightly margined above; suture well impressed; aperture oval, oblique, rather small, light brown within; peristome simple, acute, extremities united with a callosity; columella subbiplicate, light brown, tortuous, abruptly terminating in an oblique, dentiform plait. Length 17, diam. 6 1-2 mm.

Hab. Kaala Mt.—Bald.

284 a. Achatinella frosti Ancey.

Amastra frosti Anc. Mem. Soc. Zool. France, v (1892), p. 719.

Testa minute et angustissime rimata, conoideo-turrita, nitida, striis incrementi minutis pliciformibus plus minusve obsoleta impressa, luteo-staminea vel fulvido-lutea, lineis spiralibus numerosis varie dispositis, exilibus, persaepe conjunctis, badiis cincta. Spira elongata conoideo-attenuata, acuta. Anfractus 8, primi concolores, planulati, sequentes paulatim convexiusculi, sutura impressa, ultimus major, subattenuatus, rotundato-ovalis. Apertura distincte obliqua, haud ampla, irregulariter ovalis, supra attenuata. Columella modice incrassata, albida, plica acuta, prominente, unica, a basi remoto oblique armata. Peristoma simplex, acutum, marginibus callo nitido in adultis junctis. Long. 20, diam. 8 1-2, alt. apert. 7 mill.

Shell minutely and very narrowly perforate, conoidally turreted, glossy, more or less obsoletely impressed with minute plicæ-like striæ of growth, yellowish straw-color or tawny yellowish, encircled by numerous chestnut spiral lines, which are variously placed, narrow, often united; spire elongate, conoidally attenuate, acute; whorls 8, the first unicolorous, somewhat flat, the rest very slightly convex, with an impressed suture, the last large, subattenuate, rotundate oval; aperture distinctly oblique, not large, irregularly oval, attenuate above; columella moderately thickened, whitish, furnished with a single oblique, prominent, acute fold, remote from the base; lip simple, acute, in adults with the margins united by a glossy callus.

Hab. Waianae.—Bald.

285. Achatinella heliciformis Ancey.

Amastra heliciformis Anc. Bul. Soc. Malac. France, vii, 1890, p. 340.

Testa heliciformis, depressa, late umbilicata (umbilicus apertus, profundus, angulo circumdatus, circa 2 millim., saltem adaequans), haud nitida, fusca, rugoso-striatula, solidula. Spira depressa, latissime conica, obtusiuscula. Anfractus 5, regulariter crescentes, convexiusculi, sutura impressa, ultimus carinatus, supra convexo-declivis, infra convexus, antice longiuscule vixque deflexus. Apertura obliqua, lamina columellari acuta, volvente simplicique armata, emarginata, irregulariter circularis, extus angulata, basi rotundata; marginibus remotis, columellari recto-declivi cum basali angulum efformans. Diam. maj. 10, min. 9; alt. 6; alt. ap. 3 1-2 millim.

Shell heliciform, depressed, broadly umbilicate (umbilicus open, deep, angled at the margin, at least equal to about 2 mm.) not glossy, brown, roughly striatulate, somewhat solid; spire depressed, very broadly conic, somewhat obtuse, whorls 5, regularly increasing, slightly convex, with an impressed suture; the last carinate, convexly sloping above, convex below, descending gradually and for a distance in front; aperture oblique, furnished with an acute, revolving and simple columellar fold, emarginate, irregularly circular, angulate without, rotundate at the base; margins remote, columellar margin straight-sloping, forming an angle with the basal margin.

Hab. Waianae.—Bald.

2. Shells from Molokai.

286. Achatinella nubilosa Mighels.

A. nubilosa Migh. Proc. Bost. Soc., ii, 1845, p. 20.

Shell dextral, ovate, conic, thin, variously mottled with dark brown on a light ground, imperforate; whorls 6, convex; aperture semicircular; lip simple, acute. Length 7-10, diam. 2-5 in.

Dr. Mighels gives the locality of his species as Oahu, but the shell known today as *A. nubilosa* Migh. is found only on Molokai. Reeve's description of the species (Icon. Conch. Achat., London, 1850, sp. 1) is as follows: Shell ovately oblong, dextral, whorls rounded, longitudinally plicately striated, slightly crenulated at the sutures, columella furnished with a single compressed marginal plait; of a flesh-tinged straw color, irregularly striated and reticulated with blackish olive flames, interior of the aperture whitish.

Animal tessellated black and gray (when in motion), tentacles deep black, bottom of foot and mantle dark brown.—Newc.

Hab. Kalae.—Bald.

287. Achatinella humilis Newcomb.

A. humilis Newc. Am. Jour. Conch., ii. 1866, p. 211, pl. xiii, fig. 4.

Shell elongately conical, longitudinally rudely striate; whorls 7, rounded above flattened centrally, last one obscurely carinated superiorly; suture deep, simple; apex acute; aperture subrotund; lip acute, slightly thickened within; columella flattened with a thick plait; color of shell pale salmon, covered with a densely black epidermis; columella and a deep margin of the outer lip within dark brown; interior of aperture bluish white. Long. 14-20, lat. 7-20 in.

Remarks. We have very little variety to note in this species, which was obtained in considerable numbers at the locality mentioned above on only one occasion. Subsequent researches of the same ground failed in obtaining specimens.—Newc.

Hab. Kalae, on the ground under low bushes.—Newc.

288. Achatinella uniplicata Hartman.

A. uniplicata Hartman. P. Ac. Phil., 1888, p. 50, pl. i, fig. 7.

Shell dextral, solid, elongate oval, occasionally cylindrical, whorls 7, slightly rounded, the last somewhat inflated, suture impressed, longitudinally striate, aperture suboval, white; a single white elongate twisted plica within; outer lip acute, color of the shell a pale ochre-yellow, concealed by a black epidermis. L. 20, d. 9; aperture 28 [sic], d. 4 mill.

Obs. This shell is from a different island from *A. biplicata* Newc., which it resembles, the latter possesses more coarse longitudinal striæ, and has a double plicæ [sic] within, and the aperture is red, while *uniplicata* has a single plicæ [sic], and the aperture is white. The Pease collection contained a large number of duplicates marked "new species" by Mr. Pease.—Hart.

Hab. Kamalo.—Bald.

289. Achatinella umbrosa Baldwin.

Amastra umbrosa Bald. P. Ac. Phil., 1895, p. 229, pl. xi, figs. 30, 37.

Shell dextral, imperforate, solid, globosely ovate-conic; surface lustreless, covered with close, rather regular growth striæ; the lower whorls spirally maleated; the embryonic whorls finely radiately sulcated; color white, apex dark chestnut; nearly the whole surface covered with irregular streaks of a black, fugacious epidermis, worn off in front of the aperture; whorls 6, slightly convex, the last somewhat inflated; aperture ovate, a little oblique, white within; peristome acute, thickened within, expanded; columella white, flexuous, abruptly terminating in a somewhat thick lamellar plait. Length 21, diam. 12 1-2 mm.

Animal extended in motion longer than the shell. Mantle dark brown with a margin of lighter shade. Foot light brown, the superior portion and sides studded with large spots of deeper shade. Tentacles short, stout, very dark brown.—Bald.

Hab. Kamalo.—Bald.

290. Achatinella pullata Baldwin.

Amastra pullata Bald. P. Ac. Phil., 1895, p. 228, pl. xi, figs. 31, 32.

Shell dextral, imperforate, solid, elongately ovate; surface lustreless, covered with rather close, irregular, growth striæ; the embryonic whorls finely radiately sulcated; color light brown; covered with a black fugacious epidermis, dense on the last whorl, more sparsely distributed on the upper whorls, worn off in front of the aperture; apex dark brown; whorls 7, convex; suture well impressed; aperture oval, a trifle oblique, white within with a purplish tinge; peristome acute, slightly thickened within, edge dark purple; columella purplish white, flexuous, abruptly terminating in a broad, thin, slightly arched lamellar plait. Length 23, diam. 11 1-2 mm.

Unlike most of the *Amastra* [sic], which generally have dark dingy colored animals, this species has a beautiful, almost white animal. The after portion and edges of the foot under a lens are seen to be closely studded with minute pink spots which give these parts a delicate pink hue.—Bald.

Hab. Waikolu.—Bald.

291. Achatinella violacea Newcomb.

A. violacea Newc. P. Zool. Soc. London, 1853, p. 135, pl. xxii, fig. 14.

Shell dextral, ovately oblong, solid; suture plain and deeply impressed; aperture ovate; columella short, terminating with a white twisted plait; lip simple, color violaceous suffused with white. Long. 21-20, lat. 11-20 poll.

Hab. Mapulehu to Halawa.—Bald.

292. Achatinella petricola Newcomb.

A. petricola Newc. Am. Jour. Conch., 1866, ii, p. 211, pl. xiii, fig. 6.

Shell dextral, acutely conical, longitudinally coarsely striated; whorls 6, rounded, sometimes the last one inflated; suture simple, well impressed; aperture ovate; lip acute, slightly thickened within; columella rather long, with a subcentral revolving plait; often with an umbilicus; color dark corneous, outer and columellar lips margined externally with white or yellowish white. Long. .5, lat. .25 in.

Remarks. Specimens of this species vary sufficiently in the umbilical region, perhaps, to warrant their separation. Dr. Pfeiffer, the highest possible authority, has founded his species upon what I consider but a variety with a very open umbilicus, of which the figure furnishes a typical illustration. There is, however such a gradation between different specimens with an open umbilicus and those which are closed, that I have not found it possible to draw a line between the two extremes, to determine where one ceases to be my *petricola* and becomes the typical *umbilicata* of Dr. Pfeiffer.

It may not, however, be entirely uninteresting to naturalists to know the reason of the specific name given to this little shell, which, to the author, recalls a scene of thrilling interest. On the Island of Molokai, as on some others of the Hawaiian group, may be found, in the mountain regions, deep gorges inaccessible to man, with precipices of two thousand feet or more, requiring to be scaled to reach the deep, dark, narrow vale which some convulsion of Nature has opened in the mountain ridge. On such a mountain, so densely covered with bushes four or five feet high, dead specimens of what was at once detected as an unknown species were found. Desirous of obtaining a supply, the writer determined upon making his way over the bushes to an apparent opening a few rods distant. In effecting this object, the branches of a friendly tutui tree were seized and used to drag the body forward. The opening was reached, but, to my surprise, my body was poising itself over a precipice, which, to my startled imagination, knew no bottom. Resting on the yielding tops of the bushes, with no support but the friendly tutui branch, the position was one that called for immediate and decided retrograde action, which was, fortunately, effected in safety. On the rocks which formed the upper rim of the precipice some twenty or more specimens were obtained, and no shells in my cabinet have a stronger claim on my affectionate regard than these plain Achatinellæ, which live above the clouds on the bushy cliff and along the stony rim of this terrible precipice.—Newc.

Hab. On the rocky sides of a pali or precipice.—Newc. Mapulehu.—Bald.

293. Achatinella umbilicata Pfeiffer.

A. (*Laminella*) *umbilicata* Pfr. P. Zool. Soc. London, 1855, p. 205.

A. testa angustissime sed aperte umbilicata, dextr., ovato-conica, tenui, striata, opaca, fusca; spira convexiusculo-conica, apice acuta; anfr. 6 vix convexiusculis, ultimo spira paulo breviore, basi angulato; apertura elliptica, utrinque angulata, plica colum. compressa, profunda, subtransversa; perist. simplice, acuto, margine colum. subdilatato, omnino libero.

Shell narrowly but openly umbilicated, dextral, ovate-conic, thin, striated, opaque, brown; spire somewat convexly conic, apex acute; whorls 6 scarcely convex, the last a little shorter than the

spire, angulated at the base; aperture elliptical, angulate on both sides; columellar fold compressed, deep, subtransverse; lip simple, acute, slightly dilate at the margin of the columella, entirely free.

Hab. Mapulehu.—Bald.

294. Achatinella simularis Hartman.

A. simularis Hartman. P. Ac. Phil., 1888, p. 252, pl. xiii, fig. 7.

Shell dextral, ovate-conic, whorls 5 1-2, slightly rounded, body whorl somewhat inflated, two-thirds the length, suture slightly impressed; epidermis dark brown with black zigzagged lines and linear striæ, body whorl a dark red color beneath the epidermis, aperture semiovate, dark red, columella straight, with a white twisted plait near the base. L. 15, w. 7, apt. 6; diam. apt. 3 mill.

Hab. Mapulehu.—Bald.

A. simularis Hart. var. *roseotincta* Sykes. P. Malac. Soc. London, ii, 1896, p. 130.

Differs from the type in the colour being of a very much lighter shade, the apex, however, being of the usual dusky tint; the shell is also more ovate and shorter, and the lamina is slightly more horizontal. I had proposed to describe this shell as a new species, but a few specimens of the variable *A. simularis* show a slight approximation, and it will, I think, only prove to be an extreme variety.

Hab. Molokai Mts.—Perkins.

295. Achatinella citrea Sykes.

Amastra citrea Sykes. P. Malac. Soc. London, ii, 1896, p. 129.

Testa dextrorsa, imperforata, ovato-fusiformis, solidiuscula, nitidula, flavida, subobliquе valde striata, apice resinaceo, acutulo; anfr. 6, plano-convexi, primi mediocrita plicati, ultimus 2-3 altitudinis testæ æquans, epidermide nigro-brunneo leviter indutus; sutura impressa; apertura ovato-lunata; columella contorta; lamina valida, alba; peristoma simplex, margine dextro recto, acuto. Long. 15, diam. max. 8 mm.

Shell dextral, imperforate, ovate-fusiform, somewhat solid, slightly shining, yellowish, subobliquely strongly striate, apex resinaceous, slightly acute; whorls 6, plane-convex, the upper moderately plicate, the last equal to 2-3 the length of the shell, slightly covered with a blackish brown epidermis; suture impressed; aperture ovate-lunate; columella twisted; columellar fold strong, white; lip simple, dextral margin erect, acute.

Hab. Molokai.—Hutchison, Baldwin.

296. Achatinella modesta C. B. Adams.

A. modesta Adams. Contrib. to Conch., 1850, p. 128.

Shell rather thick and short, ovate-conic; dingy reddish or ash-brown; more or less covered with a dingy dark brown epidermis; with fine irregular transverse striæ, which are coarser on the upper whorls; without spiral striæ; apex subacute; spire short, with the outlines quite curvilinear; whorls 6, moderately convex, with a well impressed suture; last whorl rather ventricose; aperture ovate, somewhat acute above; lip sharp, not expanded, moderately thickened within; columellar fold well developed, quite oblique. Length .54, breadth .3 in.; length of aperture .26 in.

Hab. Molokai.—Bald.

297. Achatinella mucronata Newcomb.

A. mucronata Newc. P. Zool. Soc. London, 1853, p. 146, pl. xxiii, fig. 49.

Shell elongate-ovate; whorls 6, rounded; suture above lightly impressed, becoming deep at the junction of the last whorl; aperture small, ovate; lip simple; columella with a twisted plait; the last whorl contracted and covered with a dense black epidermis; the superior whorls white, with numerous arrow-headed brown markings. Long. 14/20, lat. 6 1/2/20 poll.

Hab. Maui.—Newc. Molokai.—Bald.

298. Achatinella fusiformis Pfeiffer.

A. fusiformis Pfr. P. Zool. Soc. London, 1855, p. 5, pl. xxx, fig. 18.

A. testa imperforata, fusiformi-oblonga, tenuiuscula, striatula, saturate fusca, pallide conspersa et oblique lineolata; spira convexio-conica, apice nigra acuta; sutura simplice; anfr. 7, vix convexiusculis, ultimo 2-5 longitudinis formante, basi attenuato; apertura obliqua, ellipsoidea; plica columellari levi, compressa, subduplicata; perist. simplici, recto, margine dextro regulariter arcuato, columellari anguste adnato. Long. 14, diam. 6 2-3 mill.

Shell imperforate, fusiform-oblong, somewhat thin, slightly striate, dark brown, mottled and obliquely striped with lighter color; spire convexly conical, apex black, acute; suture simple; whorls 7, scarcely convex, last equal to 2-5 of the length, attenuate at the base; aperture oblique, ellipsoidal; columellar fold minute, compressed, subduplicate; lip simple, erect, dextral margin regularly arcuate, columella margin narrowly adnate.

Hab. Molokai.—Bald.

This, according to Mr. Baldwin, is the same as *A. mucronata* Newc.

299. Achatinella villosa Sykes.

Amastra (*Laminella*) *villosa* Sykes. P. Malac. Soc. London, ii, 1896, p. 129.

Testa elongato-turrita, sinistrorsa, subimperforata, crassula, pallide-cornea, epidermide brunneo induta; anfr. 7–7 1-2, convexi, longitudinaliter et irregulariter valde striati; sutura bene impressa; apertura lunata, fere recta; peristoma rectum, acutum, albidum; lamina columellaris parva. Long. 20, lat. 7 mm.

Shell elongate-turreted, sinistral, subimperforate, thickish, pale horn colored, covered with a brown epidermis; whorls 7–7 1-2, convex, longitudinally and irregularly strongly striate; suture well impressed; aperture lunate, almost erect; lip acute, whitish; columellar fold small.

Hab. Molokai.—Perkins.

3. *Shells from Lanai.*

300. Achatinella biplicata Newcomb.

A. biplicata Newc. P. Zool. Soc. London, 1853, p. 156, pl. xxiv, fig. 75.

Shell dextral, elongately cylindrical; whorls 7, rounded, longitudinally strongly striated; suture deep; aperture small, subovate; inner lip rather callous; columella biplicate; outer lip acute, submarginate within; color rosy, partly concealed with a thin brown epidermis; upper whorls black; aperture red within.

Hab. Lanai.—Newc.

301. Achatinella nucula Smith.

A. nucula Sm. P. Zool. Soc. London, 1873, p. 85, pl. x, fig. 19.

Testa globoso-conica, dextrorsa, incrementi lineis striata, partim leviter malleata, sordide albida, epidermide fusco-olivacea partim induta; anfract. 5 1-2, primi 4 1-2 planiusculi, ult. globosus; sutura subcrenulata; apertura albida; perist. incrassatum; plica columellaris tenuis. Long. 12, diam. 8 mill.

Shell globose-conic, dextral, striated with lines of growth, in one part lightly malleate, dirty whitish, in another part covered with a brown-olive epidermis; whorls 5 1-2, first 4 1-2 somewhat flat, the last globose; suture subcrenulate; aperture whitish; lip thickened; columellar fold thin.

Hab. Mountains.

302. Achatinella moesta Newcomb.

A. moesta Newc. P. Zool. Soc. London, 1853, p. 157, pl. xxiv, fig. 77.

Shell dextrorsal, turrito-conical; whorls 7, convex, longitudinally striated; aperture small, ovate, slightly contracted; columella

straight, with a strong, white, spiral callus in the middle; color reddish brown; the upper whorls black, the middle ones with black zigzag lines, the last covered with a dark brown epidermis.

Hab. Lanai.

303. Achatinella obscura Newcomb.

A. obscura Newc. P. Zool. Soc. London, 1853, p. 157, pl. xxiv, fig. 78.

Shell dextrorsal, turreto-conical; whorls 7, longitudinally striated, rather convex, marginate superiorly; suture slightly impressed; aperture small, ovate; columella subtortuous, furnished with a spiral lamina; outer lip acute, simple; color dirty fulvous, covered with a blackish brown epidermis; the upper whorls black.

Hab. Lanai.

Messrs. Baldwin and Sykes place this with *A. mœsta* Newc.

304. Achatinella magna C. B. Adams.

A. magna Ad. Contrib. to Conch., 1850, p. 125.

Shell thick, ovate-conic, elongate; blackish brown at the apex, reddish brown on the middle whorls, and ash colored on the lower whorls; with unequal, irregular, very coarse transverse striæ, with close set transverse arcuate ribs near the apex, and some indistinct raised spiral lines on the lower part of the last whorl; apex subacute; spire rather long, with the outlines quite curvilinear; whorls 7, rather convex, with a well impressed suture; last whorl abruptly angular; aperture ovate, acute above, with an extremely thick deposit on the inner side, with a very large compressed columellar fold. Length 1.33, breadth .7 in.; length of ap. .61 in.

Hab. Lanai.—Bald.

Described from a single specimen.

305. Achatinella grayana Pfeiffer.

A. (*Laminella*) *grayana* Pfr. P. Zool. Soc. London, 1855, p. 204.

A. testa imperf., dextr., ovato-conica, solidula, nitidula, griseo-carnea, fasciis castaneis deorsum evanescentibus varie picta; spira inflato-conica, apice acuta, nigra; anfr. 6 1-2, superis planis, radiato-plicatis, penultimo convexo, ultimo spiram fere æquante, leviter striato; apertura subverticali, acuminato-ovali; plica colum. mediana, subtransversa, triangulari; perist. simplice recto, margine colum. vix dilatato, adnato. Long. 21 1-2, diam. 12 mill.

Shell imperforate, dextral, ovate-conic, somewhat solid, somewhat shining, grey-flesh colored, variously marked below with fading chestnut bands; spire inflated conic, apex acute, black; whorls 6 1-2, the upper flat, radiately plicate, the next to the last

convex, the last almost equal to the spire, lightly striate; aperture subvertical, acuminate-ovate; columellar fold median, subtransverse, triangular; lip simple, erect, scarcely dilated at the margin of the colmella, adnate.

Hab. Lanaihale.—Perkins. Oahu(?).—Bald.

306. Achatinella baldwinii Newcomb.

A. baldwinii Newc. P. Zool. Soc. London, 1853, p. 155, pl. xxiv, fig. 72.

Shell dextral, conically elongate, striated longitudinally; whorls 7, slightly convex, not margined; suture simple, well impressed; aperture elongate-ovate; columella long, with a white plicate tooth; lip acute, margined within with brown; aperture bluish white; labrum with a white deposit; color of shell light brown, with traces of a thin, black epidermis; first four whorls black. Long. 21-20, lat. 10-20 poll.

Hab. Lanai.

Mr. Baldwin places this with *A. magna* Ad.

307. Achatinella pusilla Newcomb.

A. pusilla Newc. Am. Jour. Conch., ii, 1866, p. 211, pl. xiii, fig. 5.

Shell dextral, conically ovate; apex acute; whorls 6, planoconvex; suture above but lightly compressed; below strongly marked; lip simple; columella short, with a twisted plait; epidermis light brown, often encircled by narrow white bands. Long. 14/20, lat. 4/20 in. var. major; long. 8 1/2/20, lat. 4/20, in. var. minor.

Remarks. The double name of *pusilla* and *pulla* was in consequence of Dr. Pfeiffer, of Cassel, publishing in my name several species which I had forwarded Mr. Cuming, in Zool. Proc., without knowing that they were already described by me in the Annals of the N. Y. Lyceum. The specimens were probably forwarded under the name given by Dr. Pfeiffer.—Newc.

Hab. Lanai.

308. Achatinella pulla (Newcomb) Pfeiffer.

A. pulla Newc. P. Zool. Soc. London, 1855, p. 209.

A. testa imperforata, acuminato-ovata, solida, distincte striata, lutescente epidermide, fusca varie fasciata, vel præter fasciam pallidam omnino obducta; spira inflata, versus apicem acutum attenuata; sutura palida; anfr. 6, primis planis, penultimo modice convexo, ultimo 3-7 longitudinis subæquante; apertura parum obliqua, sinuato-ovali; plica colum. dentiformi, subacuta, alba; perist. simplice, recto, margine columellari adnato. Long. 11, diam. 6 mill.

Shell imperforate, acuminately ovate, solid, distinctly striate, epidermis yellowish, variously banded with brown, or often entirely covering a light band; spire inflated, near the acute apex attenuate; suture pale; whorls 6, the first flat, the penultimate moderately convex, the last nearly equal to 3-7 of the length; aperture scarcely oblique, sinuately oval; columellar fold toothlike, subacute, white; lip simple, erect, columellar margin adnate.

Hab. Mountains of Lanai.

Mr. Baldwin places this with *A. pusilla* Newc.

309. Achatinella aurostoma Baldwin.

A. aurostoma Bald. Nautilus, x, 1896, p. 31.

Shell dextral, imperforate, solid, elongately ovate, spire conical, apex subacute; surface lustreless, striated with somewhat irregular, coarse growth striæ; the embryonic whorls finely radiately sulcated; color light brown, apex dark chestnut; the lower whorls covered with a black fugacious epidermis which is generally dense on the last whorl and more sparsely distributed on the other whorls; whorls 6 1-2, somewhat convex; suture well impressed; aperture ovate, a little oblique, of an orange-yellow color within; peristome simple, acute, not thickened within, extremities united by a thick, orange-tinted, parietal callosity; columella orange-yellow, flexuous, abruptly terminating in a thin, slightly curved lamellar plait. Length 25, diam. 12 mm.

Hab. Lanai.

310. Achatinella fraterna Sykes.

Amastra (Laminella) fraterna Sykes. P. Malac. Soc. London, 1896, ii, p. 129.

Testa sinistrorsa, ovato-turriformis, tenuis; sutura impressa; anfr. 6 1-2–7, convexiusculi, longitudinaliter striati, epidermide fusco vel nigro-corneo induti; apertura ovata, mediocris; peristoma rectum, acutum, lamina mediocri. Long. 10, diam. max. 5.5 mm.

Shell sinistral, ovate-turreted, thin; suture impressed; whorls 6 1-2–7, somewhat convex, longitudinally striate, covered with a brown or blackish horn-colored epidermis; aperture ovate, not large; lip erect, acute, fold moderate.

Hab. Mountains behind Koele.—Perkins.

311. Achatinella longa Sykes.

Amastra longa Sykes. P. Malac. Soc. London, 1896, p. 128.

Testa dextrorsa, elongata, subperforata, solida, substriata, epidermide nigro-fusco induta, apice acutiusculo; sutura simplex; anfr. 7, modice plani, ultimus plus quam 1-2 altitudinis testæ æquans; apertura sinuato-semiovalis,

intus albida; columella superne parum plicata, tum lamina parva transversim munita; peristoma simplex, rectum. Alt. 11 3-4, diam. max. 6 1-2 mm.

Shell dextral, elongate, subperforate, solid, substriate, covered with a blackish-brown epidermis, apex somewhat acute; suture simple; whorls 7, quite flat, the last equal to more than 1-2 the length of the shell; aperture sinuately semioval, whitish within; columella hardly plicate above, the fold, when present, is small, transverse; lip simple, erect.

Hab. Lanai.

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4. Shells from West Maui.

312. Achatinella assimilis Newcomb.

A. assimilis Pfr. P. Zool. Soc. London, 1853, p. 148, pl. xxiii, fig. 53.

Shell conically elongate, acute above; whorls 7, rounded; suture well impressed; aperture small, ovate; columella very short, plicate, twisted; lip acute, slightly thickened within; color white or salmon, sometimes the lower half of the last whorl white, and the rest of salmon; within pure white. Long. 11/20, lat. 5 1/4/20 poll.

This species might be mistaken for a dwarf variety of *A. mastersi*. Its habits are quite different, its locality distant, and the shell has an aspect quite distinct from the small varieties of *A. mastersi* as found on West Maui.—Newc.

Hab. West Maui.

313. Achatinella carinata Gulick.

Amastra carinata Gk. P. Zool. Soc. London, 1873, p. 83.

This is the var. *agglutinans* of the species *obesa*, Newc., Proc. Zool. Soc. 1853, p. 143, pl. 23, fig. 39a, where it is thus described: "Shell somewhat carinated on the last two whorls, with the keel extended by agglutinations, giving it a pagoda-like form."

Station. On the ground.—Gk.

Affinities. It is allied to *Am. obesa* Newc., but that species, which is confined to East Maui, is nearly globose with an evenly rounded body whorl, while this is strongly carinated; that also has but little of the rough bark-like epidermis with which this is loaded.—Gk.

Hab. Wailuku.—Gk

Mr. Baldwin places this with *obesa* Newc.

314. Achatinella soror Newcomb.

A. soror Newc. P. Zool. Soc. London, 1853, p. 143, pl. xxiii, fig. 38.

Shell sinistral, conically turreted; whorls 7, rounded; suture deeply impressed; aperture subovate, small; lip simple; columella very short, terminating in a twisted plicate tooth; epidermis thin, dark corneous above and light corneous below. Long. 12-20, lat. 5-20 poll.

Var. A. Last whorl white, shell solid. Length 9-20, breadth 5-20 in.

Var. B. Shell thin, dark corneous, polished. Length 10-20, breadth 4-20 in.

This species is the complete analogue of *A. acuta* found in Oahu; it has a more ventricose aspect, and the striæ are more developed in the *A. acuta*.—Newc.

Hab. Maui.—Newc. Lahaina.—Bald.

315. Achatinella ellipsoidea Gould.

A. ellipsoidea Gld. P. Boston Soc., ii, 1847, p. 200.

Testa solida, ellipsoidea, lævis, epidermide luteo interdum fusco zonato induta; spira anfr. 6, convexiusculis; sutura impressa; apertura parva, angusta; peristomate acuto, nigro; plica columellari fere transversa, tenui. Lat. 7-20, alt. 7-10 poll.

Shell solid, ellipsoidal, polished, covered with a yellow epidermis sometimes with a brown zone; whorls 6, somewhat convex; suture impressed; aperture small, narrow; lip acute, black; columellar fold almost transverse, thin.

Hab. West Maui.—Bald.

316. Achatinella pupoidea Newcomb.

A. pupoidea Newc. P. Zool. Soc. London, 1853, p. 144, pl. xxiii, fig. 42.

Shell dextral, cylindrically elongate; whorls 7, rounded; suture deep, aperture small, subovate; lip simple; columella short, lightly toothed; epidermis thin, of a light brown, beneath which the body whorl is white, the three above pinkish, and the others leaden; brown zigzag undulations are sometimes found on the upper portions of the lower whorls. Long. 14/20, lat. 5/20 poll.

Hab. East Maui.—Newc. West Maui.—Bald.

Mr. Baldwin places this with *ellipsoidea* Gld.

5. *Shells from East Maui.*

317. Achatinella mastersi Newcomb.

A. mastersi Newc. P. Zool. Soc. London, 1853, p. 153, pl. xxix, fig. 67.

Shell dextral, thin; whorls 7, rounded, slightly rugose above, the last strongly inflated; apex acute, suture well impressed; aperture ovate; lip simple; columella short with a thin lamellar plait; color of shell white or rich chestnut, with traces of a thin brown epidermis; within white or bluish white. Long. 16/20, lat. 8/20 poll.

This species I dedicate to S. I. Masters, Esq., who has been indefatigable in his researches on the islands of Oahu, Maui and Lanai, and who has furnished many choice and beautiful shells of this genus before unknown to science.

The size varies much in this species and the color is also various, running from pure white through various tints to a light mahogany. The lower part of the shell is not unfrequently white, and the upper portion bright chestnut or rose-colored.—Newc.

Hab. Makawao.

318. Achatinella nana Baldwin.

Amastra nana Bald. P. Ac. Phil., 1895, p. 232, pl. xi, figs. 48, 49.

Shell dextral, imperforate, rather thin, ovately conical, apex subacute; surface lustreless, striated with fine incremental lines, the two and one-half embryonic whorls finely, radiately sulcated; the color varies from light to dark brown, the basal half of the body whorl sometimes of lighter shade than the upper portion; covered with a black or earthy brown, fugacious epidermis, often laid on with alternating undulations, or zigzag markings; whorls 6, somewhat convex; suture impressed; aperture oval, a little oblique, white with a purplish tinge; peristome simple, very thin; columella purplish-white, flexuous, abruptly terminating in a thin lamellar plait. Length 11 1-2, diam. 6 1-2 mm.

Animal when extended in motion as long as the shell. Mantle light brown. Foot above and below brown with spots of deeper shade on the sides. Tentacles and front above almost black.

This is one of the smaller of the *Amastra* forms. It is about the size of *Amastra petricolor* Newc. from Molokai.—Bald.

Hab. Makawao.—Bald.

319. Achatinella affinis Newcomb.

A. affinis Newc. P. Zool. Soc. London, 1853, p. 142, pl. xxiii, fig. 35.

Shell acutely conical; whorls 6, rounded, not margined; suture well impressed; aperture ovate; lip thin; columella with a white

lamellar twisted tooth; color white, roseate or salmon, with traces of dark brown epidermis; last whorl lighter colored than the upper one. Long. 12/20, lat. 5 3/4/20 poll.

Hab. Kula.—Newc.

320. Achatinella gonistoma Pfeiffer.

A gonistoma Pfr. P. Zool. Soc. London, 1855, p. 203.

A. testa rimata, dextrorsa, turrita, solida, oblique striatula, subepidermide decidua fulva carneo-grisea; spira elongato-conica, apice acuta; sutura subcrenata; anfr. 8 planiusculis, penultimo convexiore, ultimo 1-3 longitudinis vix suprante, rotundato; apertura obliqua, elliptica, utrinque angulata; plica colum. subbasali, compressa, obliqua; perist. recto, basi producto, marginibus callo junctis, dextro intus sublabiato, columellari subdilatato, adnato. Long. 16, diam. 7 2-3 mill.

Shell perforate, dextral, turreted, solid, obliquely striated, fleshy gray under the deciduous, tawny epidermis; spire elongately conical, apex acute; suture subcrenate; whorls 8, somewhat flat, the next to the last slightly more convex, the last slightly more than 1-3 of the length, rotundate; aperture oblique, elliptical, angulate on both sides; columellar fold subbasal, compressed, oblique; lip erect, extended at the base, the margins united by a callus, the dextral margin slightly thickened within, the columellar margin slightly dilated, adnate.

Hab. Kula.

Mr. Baldwin places this with *A. affinis* Newc.

321. Achatinella rustica Gulick.

Amastra rustica Gk. P. Zool. Soc. London, 1873, p. 84, pl. x. fig. 17.

Testa dextrorsa, imperforata, ovato-conica, incrementi lineis leviter striata, subepidermide olivacea, dilutissime rubescens; anfract. 6, convexiusculi, primi 2 fortiter, tertiusque levius sulcati; sutura simplex, parum profunda; apertura parva, spiram nonæquans, subrubescens; perist. arcuatum, tenue; columella brevis, plica inconspicua munita, labro callo pertenui juncta. Long. 14 1-2, diam. 7 1-3 mill.

Shell dextral, imperforate, ovate-conic, lightly striated with lines of growth, under the olive epidermis very light reddish; whorls 6, somewhat convex, the first two strongly and the third more lightly sulcate; suture simple, hardly deep; aperture small, not equal to the spire, slightly reddish; lip curved, thin; columella short, furnished with an inconspicuous fold, joined to the lip by a very thin callus.

Affinities. It is allied to *Am. affinis* Newc., but is readily distinguished by its convex spire.

Remarks. It is always dextral.

Hab. Kula.

322. Achatinella conifera Smith.

Amastra conifera Sm. P. Zool. Soc. London, 1873, p. 85, pl. x, fig. 11.

Testa ovato-conica, dextrorsa, incrementi lineis leviter striata, dilutissime rubicundula, epidermide fusco-olivaceo partim induta; anfract. 6 1-2, convexiusculi, primi 2 1-2–3 rubidi fortiter radiatim sulcati, ad bases lira spirali cincti; sutura simplex; apertura albida; perist. tenue, nigrescens, vix incrassatum; plica columellaris tenuis. Long. 17, diam. 9 mill.

Shell ovate-conic, dextral, lightly striated with lines of growth, very light red, partly covered with a brown-olive epidermis; whorls 6 1-2, somewhat convex, the first 2 1-2–3 reddish, strongly radiately sulcate, encircled spirally at the base by a ridge; suture simple; aperture whitish; lip thin, blackish, scarcely incrassate; columellar fold thin.

Hab. Kula.—Sm.

It is allied to *Am. rustica* Gk.

323. Achatinella malleata Smith.

Amastra malleata Sm. P. Zool. Soc. London, 1873, p. 85, pl. x, fig. 18.

Testa acuto-ovata, dextrorsa, incrementi lineis striata, concinne malleata, sordide albida, epidermide fusco-olivaceo varie picta; anfract. 6, convexiusculi, primi 3 fortiter radiatim sulcati; sutura simplex; apertura alba; perist. tenue, intus levissime incrassatum; plica columellaris tenuis. Long. 14, diam. 8 mill.

Shell acutely ovate, dextral, striate with lines of growth, prettily maculate, dirty white, variously colored with a brownish olive epidermis; whorls 6, somewhat convex, the first 3 strongly radiately sulcate; suture simple; aperture white; lip thin, very lightly thickened within; columellar fold thin.

Hab. Kula.—Sm.

It is always dextral and is allied to *A. rustica* Gk.—Sm.

This seems to be the same as *A. affinis* Newc.

324. Achatinella obesa Newcomb.

A. obesa Newc. P. Zool. Soc. London, 1853, p. 143, pl. xxiii, fig. 39.

Shell depressed, conical, solid, inflated; whorls 5, rounded, striate; suture well marked; apex acute; aperture ovate; columella with a strong white tooth; lip thickened within; color of epidermis dark umber; aperture white. Long. 8-20, lat. 7-20 poll.

Var. *agglutinans*.

Shell somewhat carinated on the last two whorls, with the keel extended by agglutinations, giving it a pagoda-like form.

This is the most depressed of the genus, but distinctly preserves the generic characters, and in the variety exhibits a habit

in land shells found, perhaps, only in *Helicina agglutinans* of Sowerby.

Entire animal of a sooty black; superior tentacles strongly clubbed, lower ones with a light colored tip, granulations large; longer than the shell; motions very slow and timid.—Newc.

Hab. Haleakala.—Newc. Makawao and Kula.—Bald.

325. Achatinella nigra Newcomb.

A. nigra Newc. Am. J. Conch., ii, 1866, p. 210, pl. xiii, fig. 3.

Shell dextral, globosely acuminate, rather solid; the two lower whorls inflated, the superior ones subulate; whorls 6, the last two cut up on the surface into rude cicatrices by longitudinal striæ, crossed by revolving elevations, irregularly distributed; superior whorls flattened, with closely crowded, strong, longitudinal striæ; suture simple, well impressed; aperture round ovate; columella short, terminating in a lamellar tooth; color yellowish white, with a thin black epidermis. Long. .70, lat. .45 in.

Remarks. This species occupies a middle space between *A. obesa* Nob., and *A. kauaiensis*. In adult specimens the lip is thickened by a heavy white deposit, and the tooth from the same cause changes from a lamellar to a nodulous form, as in the specimen figured.—Newc.

Hab. Ulupalakua.—Bald.

326. Achatinella gigantea Newcomb.

A. gigantea Newc. P. Zool. Soc. London, 1853, p. 136, pl. xxii, fig. 17.

Shell dextral, elongate-oval, apex pointed; whorls 7, strongly striate, slightly carinated superiorly on the last whorl, inferiorly on the penultimate; columella slightly arched, terminating internally in a slight callosity, externally continued to unite with the outer lip; columellar lip with a strong deposit spread over the surface; outer lip simple; suture deep; striæ longitudinal; color light plumbeous externally, internally pale lilac. Long. 1 1/2, lat. 12/20 poll.

This species, the largest yet described, belongs to the same group with *A. violacea*, from Molokai, and *A. baldwinii*, from Lanai.—Newc.

Hab. Haleakala.—Newc.

327. Achatinella hutchinsonii Pease.

Helicter hutchinsonii Pease. P. Zool. Soc. London, 1862, p. 7.

Shell acuminately turreted, sinistral, imperforate; whorls 7, flatly convex, coarsely and irregularly striated longitudinally, not

marginated; sutures somewhat rude, well impressed; aperture ovate, about 2-5 the length of the shell; columellar fold slight, oblique tortuous; shell covered with an earthy-brown epidermis; apex of a darker colour; aperture and columella white, shining.

Hab. Makawao and Kula.—Bald.

328. Achatinella farcimen Pfeiffer.

A. (*Laminella*) *farcimen* Pfr. P. Zool. Soc. London, 1856, p. 334.

A. testa sinistrorsa, subperforata, oblongo-conica, solidula, rugulosa, subepidermide nigricante albida; spira superne in conum acutum nudum terminata; anfr. 7, superis planis, 2 ultimis perconvexis, ultimo 1-3 longitudinis paulo superante, medio subangulato; plica columellari compressa, obliqua; apertura obliqua, semiovali, intus alba; perist. simplice, recto, margine columellari subpatente. Long. 19, diam. 9 mill.

Shell sinistral, subperforate, oblong-conic, somewhat solid, rough, whitish under the blackish epidermis, the upper part of the spire terminating in an acute bare cone; whorls 7, the upper flat, the last 2 very convex, the last a little more than 1-3 of the length, subangulate at the middle; columellar fold compressed, oblique; aperture oblique, semioval, white within; lip simple, erect, slightly spreading at the margin of the columella.

Hab. Maui.

6. Shells from Hawaii.

329. Achatinella melanosis Newcomb.

A. melanosis Newc. P. Zool. Soc. London, 1853, p. 144, pl. xxiii, fig. 41.

Shell dextral, thin, conically depressed; apex acute; whorls 5, rounded, the last inflated; suture well impressed; aperture subrotund; lip simple, thin; columella straight, white, and terminating in a very oblique plait; color black. Long. 8-20, lat. 5-20 poll.

Hab. Hawaii.

330. Achatinella flavescens Newcomb.

A. flavescens Newc. P. Zool. Soc. London, 1853, p. 151, pl. xxiv, fig. 62.

Shell dextral, conical; whorls 6, slightly rounded; suture simple, well impressed; striæ numerous, longitudinal and well developed; aperture semiovate; lip simple; columella short, with an oblique plaited tooth; color of shell externally of a uniform light reddish colour, internally white or pale rose. Long. 13-20, lat. 6-20 poll.

This species belongs to a group, at the head of which stands *A. rubens* of Gould. Its specific character is sufficiently marked. It is one of the three large species thus far obtained on the large island of Hawaii.—Newc.

Hab. Hamakua, Kau and Olaa.

331. Achatinella henshawi Baldwin.

Amastra henshawi Bald. Nautilus, Boston, 1903, p. 34.

Shell dextral, imperforate or subperforate, solid, ovately conical, apex subacute; surface lustreless, striated with somewhat irregular lines of growth; embryonic whorls under a lens showing very delicate radiating sulcations; color varies from light to very dark brown, the upper whorls generally much darker than the body whorl; the lower whorls with traces of a deciduous, brown epidermis; whorls 6, somewhat convex, the last one with a light carination at the periphery; suture well impressed; aperture ovate, a little oblique, livid white within; peristome acute, slightly thickened within, extremities united with a thin, livid-white parietal callosity; columella white, flexuous, abruptly terminating in a thin lamellar plait. Length 18, diam. 10 mm.

Found in damp woods at the roots of ferns and nearly buried in trash, at altitudes of from 1800 to 4000 feet.—Bald.

Hab. South Kona.—Bald.

This seems to be the same as *A. flavescens* Newc., found at Hamakua and Kau.

332. Achatinella senilis Baldwin.

Amastra senilis Bald. Nautilus, Boston, 1903, vol. xvii, p. 35.

Shell fossil, dextral, deeply perforated, the perforation penetrating to the apex; moderately solid, globose with a short conical spire, apex acute; surface sculptured with coarse, irregular growth lines, with a few irregular cross striæ or ridges on the three lower whorls; embryonic whorls under a lens exhibiting delicate and regular sulcations; color of the living shell unknown; whorls 7, convex; aperture sinuately oval, a little oblique; peristome simple, acute, not thickened within, extremities joined by a thick parietal calosity; columella terminating in a slight, flexuous fold. Length 23, diam. 18 mm.

This and the following species were discovered and sent to me by Mr. Eugene Horner, of Paauilo, Hawaii. They were found at a place called Palihoukapapa, on the Hamakua slope of Mauna Kea, at an elevation of 4000 feet. The shells were imbedded in the earth about one foot below the surface.

Prof. Henshaw reports other similar localities on the island of Hawaii, where there are extensive deposits of fossilized land shells about a foot below the surface of the humus. Nearly all the known genera of Hawaiian land shells are represented in these deposits by species, some still extant, others probably now extinct. The deposit of earth above the fossilized shells indicates several hundred years of antiquity.—Bald.

Hab. Hamakua.—Bald.

333. Achatinella fossilis Baldwin.

Amastra fossilis Bald. Nautilus, Boston, 1903, vol. xvii, p. 35.

Shell fossil, dextral, minutely perforated, somewhat solid; elongately conical, apex rather acute; surface striated with somewhat irregular growth lines; embryonic whorls under a lens exhibiting very delicate and regular sulcations; color of living shell unknown; whorls 7, slightly convex; aperture oblique, ovate; peristome simple, very thin, columellar margin slightly expanded over the umbilicus; columella terminating in a flexuous thread-like plait. Length 18, diam. 9 mm.

This shell in shape resembles some of the forms of *Amastra turritella* Fér., which is found on the island of Oahu.—Bald.

Hab. Hamakua.—Bald.

334. Achatinella saxicola Baldwin.

Amastra saxicola Bald. Nautilus, Boston, 1903, vol. xvii, p. 36.

Shell dextral, imperforate, rather solid, elongately ovate-conic, apex subacute; surface lustreless, sculptured with delicate growth lines; embryonic whorls smooth and polished; color reddish-brown, tending to lighter shade on the middle whorls; apex pearly white; destitute of the usual fugacious epidermis of this genus; whorls 7, slightly convex; suture well impressed; aperture ovate, a little oblique, pinkish within; peristome simple, acute, not thickened within, extremities joined by a very thin, pinkish parietal callosity; columella white, flexuous, terminating in a moderately developed lamellar plait. Length 20 1-3, diam. 10 mm.

This shell seems to live among and under rocks to an unusual degree. It is found on old lava flows attached to the under side of rocks, or in loose soil and trash at the base of bunch grass growing on lava flows. The locality is very arid.—Bald.

Hab. Kau.—Bald.

7. Shells from Kauai.

335. Achatinella nucleola Gould.

A. nucleola Gould. P. Boston Soc., ii, 1845, p. 28.

Testa solida, imperforata, ovato-globosa, livido-castanea, apice pallida, ad suturam et antice albida; anfr. 6, postice subtabulatis; apertura rotundata, labro simplici; coiumella excavata, callo obtecto; plica parva. Long. 9-20, lat. 1-4 poll.

Shell solid, imperforate, ovately globose, bluish chestnut, apex pale, whitish antically and at the suture, postically somewhat flat; aperture rotundate, lip simple; columella arcuate, covered with a callus; fold small.

Hab. Hanalei.—Bald.

336. Achatinella brevis Pfeiffer.

A. brevis Pfr. P. Zool. Soc. London, 1845, p. 90.

Ach. testa ovata, brevi, solida, oblique striatula, nitida, fusca; spira conica, acutiuscula; anfractibus 6 convexiusculis, ultimo 1-3 longitudinis vix superante, subgloboso; columella breviter arcuata, acute dentata; apertura rotundato-lunari; peristomate simplice, albo. Long. 11, diam. 6 1-2 mill.

Shell ovate, short, solid, obliquely striated, shining, brown; spire conic, somewhat acute; whorls 6, slightly convex, the last slightly more than 1-3 of the length, subglobose; columella slightly arcuate, acutely dentate; aperture rotundate-lunate; lip simple, white.

Hab. Hanalei.

Mr. Baldwin places this with *A. nucleola* Gld.

337. Achatinella anthonii Newcomb.

A. anthonii Newc. Am. Jour. Conch., ii, 1866, p. 210. pl. xiii, fig. 2.

Shell conically ovate, solid, blackish-brown, longitudinally striate; whorls 6, inflated; suture moderately impressed; apex obtuse; aperture obliquely ovate, subangulate below; lip simple, thickened within; columella short, straight, with a somewhat callous plication below the middle; white banded below the suture, and of a dirty white in the umbilical region. Length 15, diam. 10 mm.; ap. length 6, diam. 4 1-2 mm.

Remarks. Excepting in size, and in being more ventricose, this species makes a near approach to *A. nucleola* Gld. It is more than quadruple the size of *nucleola*, and not acute at the summit, by which it can at once be distinguished from that species. For

this and the preceding species I am indebted to Rev. Mr. Johnson of Koloa. It is named after the eminent naturalist John G. Anthony Esq., of Cincinnati, Ohio.

The specimen selected for figuring is more obese than usual, and less elongated. A well marked variety has the last whorl of pale straw.—Newc.

Hab. Kauai.—Bald.

338. Achatinella kauaiensis Newcomb.

A. kauaiensis Newc. Am. Jour. Conch., ii, 1866, p. 209, pl. xiii, fig. 1.

Shell imperforate, dextral, trochiform, solid, strongly striated and decussated, above blackish-brown, the carina and base dirty white colored; suture crenulated, 7 whorls, flatly convex, the last with a cord-like keel in the middle; aperture irregularly quadrate; columella short, twisted, with one fold. Long. 9-10, lat. 8-10 in. Aperture, long. 4-10, lat. 5 1-4/10 in.

Remarks. This is undoubtedly one of the most singular forms presented in the genus, and of extreme rarity. The specimen selected for the figure varies from the type in being provided upon the back of the last whorl with three instead of one keel. Kauai is the most western of the large islands of the Sandwich group, and by geologists is considered as the oldest of the series; and it is worthy of remark that not a typical arboreal species of this genus has been met with, nor one ornamented with a variety of painted patterns, as upon the islands farther east.—Newc.

Hab. Kauai.

339. Achatinella knudsenii Baldwin.

Amastra knudsenii Bald. P. Ac. Phil., 1895, p. 234, pl. xi, figs. 43, 44.

Shell dextral, imperforate, solid, elongately ovate, spire conical, apex subacute; surface lustreless, coarsely and irregularly wrinkled by growth striæ; embryonic whorls very finely radiately sulcated; color very dark brown, tending to a lighter shade on the elevated portions of the lower whorl; whorls 7, the three lower ones strongly angulated a little below the suture, the last one with a cord-like keel at the periphery and numerous coarse cross striæ above and below the periphery; suture well impressed; aperture oblique, elongately oval, dark purple inside with a satin-like lustre; peristome acute, not thickened within; columella terminating in a long, narrow, flexuous, pearly-white plait. Length 33, diam. 17 mm.

Both this species and *Amastra kauaiensis* Newc. are characterized by the long, flexuous thread-like columellar plait which is

peculiar to the genus *Carelia* of Kauai. Examination of the animals may prove them both aberrant forms of that genus.

The species is very rare. We dedicate it to Mr. A. Knudsen, the young naturalist who discovered it. He writes that it is of very limited distribution, being found far up the mountain only in an isolated tract of wood land which escaped the forest fires of twenty years ago. In three days' diligent search he found only twelve living examples.—Bald.

Hab. Halemanu.—Bald.

340. Achatinella cyclostoma Baldwin.

Amastra cyclostoma Bald. P. Ac. Phil., 1895, p. 234, pl. xi, fig. 53.

Shell dextral, narrowly but deeply perforated, the perforation penetrating to the apex, somewhat solid, oblately globular with a short conical spire, apex acute; surface lustreless, sculptured with close, obliquely descending, flexuous growth lines, which become concentric around the umbilicus; the embryonic whorls smooth or with delicate, radiating sulcations; color brown, darker on the spire; whorls 6, the upper ones rather flat, rapidly increasing; the last one large, forming the greater part of the shell, strongly angled at the periphery, the angle becoming almost obsolete towards the aperture, deflexed in front a trifle below the carina, surface above the angle flat, slightly convex towards the aperture, and rounded below the angle; suture well impressed; aperture very oblique, sinuately circular, a small segment cut off by the penultimate whorl, livid-white within, exhibiting the exterior coloring through its substance; peristome rather obtuse, slightly thickened within; unreflected, extremities slightly converging and united by a very thin callosity; columella livid-white, broad and flat, terminating in a slight, flexuous plait. Altitude 15, diam. 18 mm.

Hab. Makaweli.—Bald.

341. Achatinella rugulosa Pease.

A. rugulosa Pse. P. Zool. Soc. London, 1869, p. 649; J. Conch., xviii., 1870, p. 95.

T. ovato-conica, crassa, rimata, oblique rugoso-striatula, epidermide rugosa, brunnea induta, sub epidermide castanea, ad marginem labii et circa basin albida, apice nigricans; anfr. 6 convexis, interdum vix inflatis; sutura impressa; apertura ovata, verticalis; plica columellaris valida, callosa, compressa, fere transversalis; labro incrassato. Long. 12, diam. 9 mm.

Shell ovate-conic, thick, with an umbilical cleft, obliquely rugose-striated, furnished with a rough, brown epidermis, under the epidermis chestnut colored, at the margin of the lip and around the base whitish, apex blackish; whorls 6 convex, sometimes scarcely inflated; suture impressed; aperture ovate, vertical; columellar fold strong, thickened, compressed, almost transverse; lip thickened.

Hab. Kapaa.—Bald.

342. Achatinella extincta Pfeiffer.

A extincta Pfr. P. Zool. Soc. London, 1855, p. 204.

A. testa perforata, ovato-turrita, solida, striatula, cretacea; spira elongata, sursum attenuata, acuta; anfr. 7 vix convexiusculis, ultimo 1-3 longitudinis non attingente, juxta perforationem subcompresso; apertura vix obliqua, rhombeo-ovali, basi angulata; plicata colum. compressa, fere a basi ascendente; perist. simplice, recto marginibus callo crasso, subnodifero junctis, columellari dilatato, libero. Long. 16, diam. 7 1-2 mill.

Shell perforate, ovately turreted, solid, somewhat striate, chalky; spire elongate, attenuate above, acute; whorls 7 scarcely convex, the last not reaching 1-3 of the length, subcompressed adjoining the umbilicus; aperture scarcely oblique, rhomboidal-oval, angulate at the base; columellar fold compressed, almost ascending from the base; lip simple, erect, with the margins united by a thick nodiform callus, columellar margin dilated, free.

Hab. Kauai, Maui and Oahu.—Bald.

343. Achatinella similaris Pease.

A. rugulosa Pse., var. *similaris*. J. Conch., xviii, 1870, p. 96.

T. subfossilis, latius umbilicata; plica columellaris parum prominens; apertura ad basin subangulata.

Shell subfossil, broadly umbilicate; columellar fold hardly prominent; aperture subangulate at the base.

Hab. Mana.—Bald.

344. Achatinella sphærica Pease.

Amastra sphærica Pse. P. Zool. Soc. London, 1860, p. 649; J. Conchyl. xviii, 1870, p. 94.

T. globosa, solida, umbilicata, dextrorsa, epidermide oblique rugoso-striata induta; spira brevis, conica, acutiuscula; anfr. 5, vix inflatis; sutura impressa, simplex; apertura rotundata; plica columellaris valida, linguæformis, callosa; fusca, apertura alba, apice nigra. Alt. 9, diam. 12 mill.

Shell globose, solid, umbilicate, dextral, covered with an epidermis obliquely rugose-striated; spire short, conical, somewhat acute; whorls 5, scarcely inflated; suture impressed, simple; aperture rotundate; columellar fold strong, tongue-like, thickened; brown, aperture white, apex black.

Hab. Kauai.—Pse. Lanai.—Bald.

ADDENDA.

345. Achatinella irregularis Pfeiffer.

Amastra irregularis Pfr. P. Zool. Soc. London, 1855, p. 205.

A. testa imperf., dextr., tenuiuscula, longitudinaliter confertim plicata, nigricante, interdum albido-fasciata; spira irregulari, conica, obtusa; sutura subcrenata; anfr. 5 1-2 celeriter accrescentibus, convexis, penultimo gibbo, ultimo 3-7 longitudinis subæquante, infra medium læviore, interdum corneo; apertura vix obliqua, ovali-oblonga; plica colum. supera, parum prominente; perist. simplice, margine dextro antrorsum subarcuato, columellari dilatato, adnato. Long. 9, diam. 4 1-3 mill.

Shell imperforate, dextral, quite thin, longitudinally closely plicate, blackish, sometimes banded with white; spire irregular, conic, obtuse; suture subcrenulate; whorls 5 1-2 rapidly increasing, convex, the penultimate gibbous, the last nearly equal to 3-7 of the length, smoother below the periphery, sometimes corneous; aperture hardly oblique, oval-oblong; columella fold high, hardly prominent; lip simple, dextral margin slightly arcuate below, columellar margin dilated, adnate.

Hab. ?

346. Achatinella alba Nuttall.

A. alba Nuttall. Jay, Cat. Shells, Ed. iii, 1839, p. 58 (nomen. solum).

This shell equals *A. lorata* Fér. (white variety).

Hab. Oahu.

347. Achatinella vestita Mighels.

A. vestita Migh. Proc. Bost. Soc., ii, 1845, p. 20.

Shell sinistral, acuminate-conical, light brown, or white, with beautiful, narrow, dark brown bands, more or less numerous, imperforate; whorls 6, convex; aperture semilunate; lip reflected.

Average length 1 in., diam. 1-2 in.

Hab. Waianae, Oahu.—Migh.

348. Achatinella seminigra Lamarck.

Monodonta seminigra Lam. Hist. Nat. Anim. Paris, 1843, vol. ix, p. 181.

M. testa oblique conica, imperforata, læviuscula, inferne nigra, superne alba; dente columellari albo; labro simplici.

Shell obliquely conical, imperforate, somewhat smooth, black below, white above; columellar tooth white; lip simple.

Hab. Waialua, Oahu.

This equals *Apex fulva* Dixon or *A. lugubris* Chem.

349. Achatinella monarcha Pfeiffer.

A. monarcha Pfr. P. Zool. Soc. London, 1855, p. 3, pl. xxx, fig. 9.

A. testa imperforata, ovato-conica, solida, oblique striatula, parum nitida, griseoalba, lineis fuscis varie cincta; spira elevato-conica, acutiuscula; sutura leviter marginata, subcrenulata; anfr. 6, convexiusculis, ultimo spira paulo breviore, basi rotundato; apertura obliqua, late obauriformi; plica columellari supera, obliqua, mediocri; perist. sublabiato, margine dextro breviter expanso, columellari crasso, flexuoso, adnato. Long. 20, diam. 10 1-2 mill.

Shell imperforate, ovately conical, solid, obliquely striate, hardly shining, grayish white, variously banded with brown lines; spire elongately conical, somewhat acute, suture slightly marginate, subcrenulate; whorls 6, somewhat convex, the last a little shorter than the spire, rotundate at the base; aperture oblique, broadly obauriform; columella fold high, oblique, of moderate size; lip slightly thickened, dextral margin shortly expanded, columellar margin thickened, tortuous, adnate.

Hab. Sandwich Ids.—Frick. Waianae Mts., Oahu.

The figure gives a shell like *A. multilineata* Newc.

350. Achatinella swainsoni Pfeiffer.

A. swainsoni Pfr. P. Zool. Soc. London, 1855, p. 4, pl. xxx, fig. 13.

A. testa sinistrorsa, imperforata, ovato-conica, solidula, sublævigata, nitida, albida, fulvo tenuiter strigata; spira conica, apice fulva, acutiuscula, sutura marginata; anfr. 5 1-2, convexiusculis, ultimo 3-5 longitudinis subæquante, infra suturam turgido, basi rotundato; apertura fere diaganali obauriformi; plica columellari supera, valida, nodiformi; perist. nigro-fusco limbato, margine externo reflexiusculo, intus crasso labiato, columellari crasso, flexuoso, adnato. Long. 20, diam. 11 mill.

B. Virenti-lutea, anfr. ultimo antice castaneo.

Shell sinistral, imperforate, ovately conical, somewhat solid, nearly smooth, shining, whitish, faintly striped with tawny; spire conical, apex tawny, somewhat acute, suture marginate; whorls 5 1-2, slightly convex, the last nearly equal to 3-5 of the length, swollen below the suture, rotundate at the base; aperture nearly diagonal, obauriform; columellar fold high, strong, nodiform; lip edged with blackish brown, external margin somewhat reflexed, densely thickened within, columellar margin thickened, tortuous, adnate.

B. Greenish yellow, with the last whorl chestnut above.

Hab. Sandwich Ids.—Frick.

May be a variety of *A. sordida* Newc. from the Waianae Mts., Oahu.

351. Achatinella crassidentata Pfeiffer.

A. crassidentata Pfr. P. Zool. Soc. London, 1855, p. 6, pl. xxx, fig. 23.

A. testa imperforata, sinistrorsa, solidula, striatula, parum nitida, alba, fasciis non nullis luteis ornata, interdum basi virenti-lutea; spira conica, apice obtusula; sutura marginata; anfr. 5 1-2, convexiusculis, ultimo 3-7 longitudinis subæquante, basi rotundato; apertura diagonali, sinuato-semiovali; plica columellari supera, crassissima, dentiformi; perist. simplice, margine externo acuto, leviter arcuato, columellari brevi, angusto. Long. 20, diam. 11 mill.

Shell imperforate, sinistral, somewhat solid, slightly striate, hardly shining, white, ornamented with several yellowish bands, sometimes greenish yellow on the base; spire conical; apex somewhat obtuse; suture marginate; whorls 5 1-2, slightly convex, with the last nearly equal to 3-7 of the length, rotundate at the base; aperture diagonal, sinuately semioval; columellar fold high, very thick, tooth-like; lip simple, external margin acute, slightly arcuate, columellar margin short, narrow.

Hab. Sandwich Ids.—Frick. Palolo to Waialae, Oahu.

This shell agrees with *A. diversa* Gk.

352. Achatinella hybrida Newcomb.

A. hybrida Newc. P. Zool. Soc. London, 1853, p. 147, pl. xxiii, fig. 52.

Shell dextral, conical; whorls 6, rounded, margined above, the last somewhat inflated; suture well impressed; columella white or brownish, terminating in a twisted plait; aperture ovate, white; lip simple, thickened within; striæ longitudinal, fine; colour of shell green, or brown on the last whorl, above white, with fine longitudinal veins of the colour of the epidermis. Long. 18-20, lat. 10-20 poll.

Hab. Kolau, Oahu.—Newc.

This shell is a manufactured variety from *A. producta* Rve.

353. Achatinella macrostoma Pfeiffer.

A. macrostoma Pfr. P. Zool. Soc. London, 1855, p. 2, pl. xxx, fig. 6.

A. testa dextrorsa, imperforata, conico-ovata, solidula, levissime striatula, nitida, fulva, fasciis non nullis pallidis et fuscis variegata; spira conica, obtusula; sutura submarginata; anfr. 5 1-2, modice convexis, ultimo spiram æquante, superne turgido, medio attenuato, basi rotundato; apertura parum obliqua, ampla, obauriformi, intus alba; perist. albo, leviter labiato, margine dextro expanso, superne valde curvato, columellari dilatato, adnato. Long. 21 1-2, diam. 11 mill.

Shell dextral, imperforate, conically ovate, somewhat solid, very lightly striate, shining, tawny, ornamented with several pale and brown bands; spire conical, somewhat obtuse; suture submarginate; whorls 5 1-2, moderately convex; with the last equal in length to the spire, turgid above, diminishing at the middle, base rotundate; aperture hardly oblique, large, obauriform, white within; lip lightly thickened, with dextral margin expanded, strongly arcuate above, columellar margin dilated, adnate.

Hab. Sandwich Ids.—Frick. Palolo to Waialae, Oahu.

This seems to be the same as *A. viridans* Migh., a somewhat lighter variety.

354. Achatinella radiata Pfeiffer.

A. radiata Pfr. P. Zool. Soc. London, 1845, p. 89.

A. testa ovata, solidula, leviter striata, nitida, viridi et luteo radiata, strigis intercurrentibus nigricantibus; spira conica, obtusiuscula; sutura marginata; anfractibus 5 1-2 vix convexiusculis, ultimo spira paulo breviore; columella dente brevi calloso rubello munita; apertura oblongo-ovali; perist. intus fusco-rubello-labiato. Long. 19, diam. 10 mill.

Shell ovate, quite solid, lightly striate, shining, striped with green and yellow, with blackish stripes between; spire conic, somewhat obtuse; suture marginate; whorls 5 1-2 scarcely convex, the last a little shorter than the spire; columella furnished with a short, thickened, reddish tooth; aperture oblong-oval; lip thickened with brownish red within.

Hab. Nuuanu to Palolo, Oahu.

Mr. Baldwin places this with *A. viridans* Migh.

355. Achatinella oviformis Newcomb.

A. oviformis Newc. P. Zool. Soc. London, 1855, p. 208.

A. testa sinistrorsa, imperforata, ovato-conica, solida, striatula, subepidermide nitida, olivacea alba, fusco 1-3 fasciata; spira convexo-conica, apice acutiuscula, alba; sutura profunde marginata; anfr. 5 vix convexiusculis, ultimo 3-7 longitudinis subæquante; apertura fere diagonali, auriformi; plica colum. mediocri, dentiformi, rubella; perist. recto, marginibus callo tenui junctis, externo intus labiato, columellari dilatato, adnato. Long. 17, diam. 8 2-3 mill.

Shell sinistral, imperforate, ovately conical, solid, somewhat striate, under the epidermis shining, olive white, with 1-3 brown bands; spire convexly conical, apex somewhat acute, white; suture deeply margined; whorls 5 scarcely convex; last nearly equal to 3-7 of the length; aperture almost diagonal, auriform; columellar

fold small, tooth-like, reddish; lip erect, the margins united by a thin callus, the external margin thickened within, columellar margin dilated, adnate.

Hab. Kahana, Oahu.

Considered a variety of *A. multicolor* Pfr.

356. Achatinella planospira Pfeiffer.

A. planospira Pfr. P. Zool. Soc. London, 1855, p. 3, pl. xxx, fig. 8.

A. testa imperforata, dextrorsa, ovato-pyramidata, solida, conferte striata et sublente obsoletissime decussata, nitida, nigricante, fasciis non nullis albis vel luteis, angustis ornata; spira conica, acutiuscula; sutura lineari, marginata; anfr. 5 1-2, planis, ultimo spira paulo breviore, obsolete angulato, basi rotundato; apertura obliqua, obauriformi; plica columellari supera, valida, torta, alba; perist. crasse albo-labiato, margine dextro repando, breviter expanso, columellari adnato. Long. 19, diam. 9 1-2 mill.

Shell imperforate, dextral, ovately pyramidal, solid, closely striate and under a lens obsoletely decussate, shining, blackish, ornamented with several narrow white or yellowish bands; spire conical, somewhat acute; suture marginate; whorls 5 1-2, flat, with the last slightly shorter than the spire, obsoletely angulate, base rotundate; aperture oblique, obauriform; columellar fold high, strong, twisted, white; lip heavily thickened, white, dextral margin spreading, slightly expanded, columellar margin adnate.

Hab. Sandwich Ids.—Frick. Kahana, Oahu.

This is a variety of *A. decipiens* Newc.

357. Achatinella fulva Newcomb.

A. fulva Newc. P. Zool. Soc. London, 1855, p. 208.

A. testa subperforata, turito-conica, solida, striatula et sub lente subtilissime decussata, nitida, luteo-fulva; spira subconcavo-conica, apice alba, acuta; sutura filomarginata; anfr. 6 1-2, superis planis, sequentibus convexis, ultimo 1-3 longitudinis paulo superante, infra suturam turgido, basi saccato; apertura obliqua, subtetragono-auriformi; plica colum. supera, nodiformi, aurantiaca; perist. recto, intus labiato, margine dextro substricto. Long. 18 1-2, diam. 9 mill.

Shell subperforate, turreted-conic, solid, somewhat striate and under a lens very finely decussate, shining, yellowish tawny; spire subconcave-conic, apex white, acute; suture margined with a line; whorls 6 1-2, the upper flat, the following convex, the last a little more than 1-3 of the length, below the suture inflated, saccate at the base; aperture oblique, subtetragonal-auriform; columellar fold high, nodiform, golden; lip erect, thickened within, dextral margin slightly constricted, columellar margin dilated, arched-reflexed.

Hab. ?

358. Achatinella reevei Adams.

A. reevei Adams. Ann. Lyc. New York, v, 1852, p. 44.

Although the name *A. radiata* Pfr. appears in Dr. Pfeiffer's Hel. Monog. as a synonym of *A. viridans* Migh., yet Mr. Reeve, in his beautiful monograph of this genus, has represented this species under the name of *A. radiata*, and has given another species with Dr. Mighel's name. Dr. Mighel and myself about the same time received this very distinct species, and having seen it in his collection, I cannot doubt the correctness of Dr. Pfeiffer's synonymy. Some other specimens before me appear to be very exactly represented by Mr. Reeve's figure of *A. viridans*, and are most nearly allied to a group consisting of *A. pulcherrima* Swains., *A. castanea* Rve., *A. abbreviata* Rve., etc. I propose for Mr. Reeve's *A. viridans* the name which stands at the head of this paragraph. —Adams.

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1. cestus Newc.
2. lorata Fér.
3. decora Fér.
4. turgida Newc.
5. forbesiana Pfr.

6. lugubris Chem.
7. swiftii Newc.
8. perversa Swain.
9. musteliua Migh.
10. fulgens Newc.

11. diversa Gk.
12. vulpina Fér.
13. producta Rve.
14. olivacea Rve.
15. bellula Sm.

16. colorata Rve.
17. casta Newc.
18. pulcherrima Swain.
19. livida Swain.
20. albescens Gk.

21. viridans Migh.
22. abbreviata Rve.
23. lyonsiana Bald.
24. rugosa Newc.
25. ovata Newc.

ACHATINELLIDÆ.

ACHATINELLA.—Plate II.

1. bulimoides Swain.
2. glabra Newc.
3. lymaniana Bald.
4. dubia Newc.
5. bella Rve.

6. tessellata Newc.
7. dwightii Newc.
8. virgulata Migh.
9. polita Newc.
10. crassa Newc.

11. variabilis Newc.
12. porcellana Newc.
13. marmorata Gld.
14. eburnea Gk.
15. anceyana Bald.

16. nivea Bald.
17. splendida Newc.
18. terebra Newc.
19. tappaniana Ad.
20. perdix Rve.

21. physa Newc.
22. hawaiiensis Bald.
23. gravida Fér.
24. sanguinea Newc.
25. venusta Migh.

ACHATINELLIDÆ.

ACHATINELLA.—Plate III.

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1. tetrao Newc.
2. concinna Newc.
3. picta Migh.
4. alexandri Newc.
5. helena Newc.

6. maniensis Newc.
7. ornata Newc.
8. minuscula Pfr.
9. newcombiana Pfr.
10. philippiana Pfr.

11. plicata Migh.
12. cumingii Newc.
13. tristis Fér.
14. ventulus Fér.
15. nigrolabris Sm.

16. porphyrea Newc.
17. heliciformis Anc.
18. frosti Anc.
19. biplicata Newc.
20. nucula Sm.

21. nubilosa Migh.
22. umbrosa Bald.
23. violacea Newc.
24. hutchinsoni Pse.
25. knudsenii Newc.

ACHATINELLIDÆ.

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BY

DR. HENRY A. PILSBRY

AND

C. MONTAGUE COOKE, JR.

HONOLULU, H. I.
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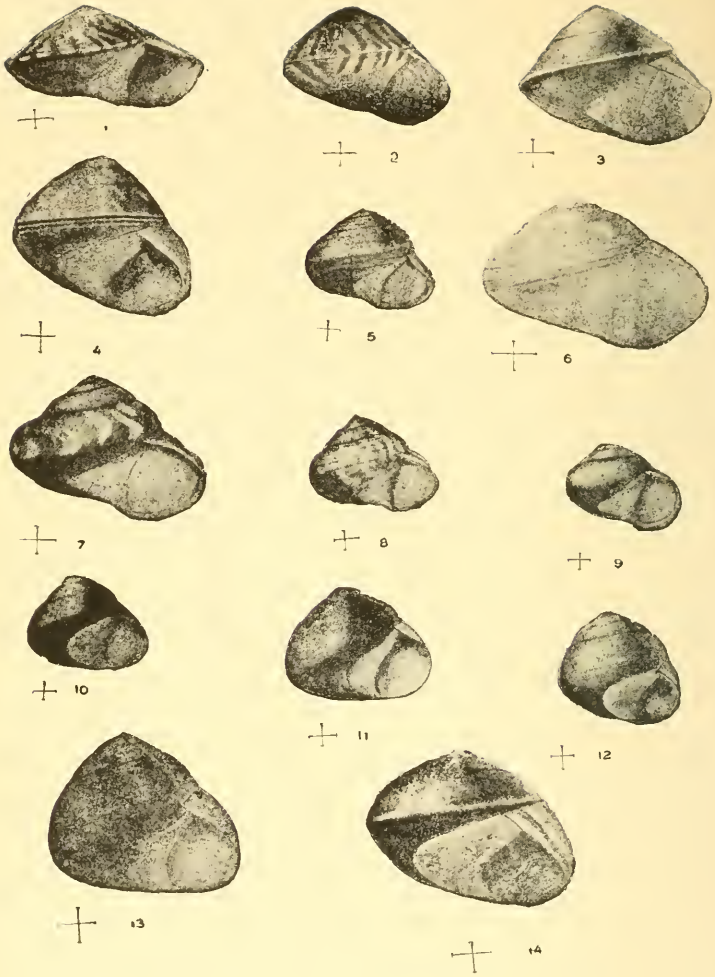

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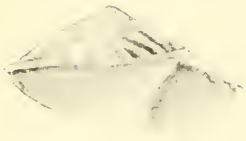

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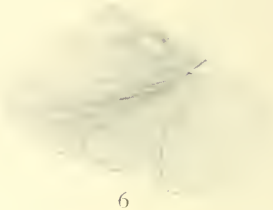

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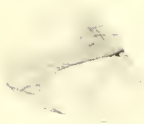

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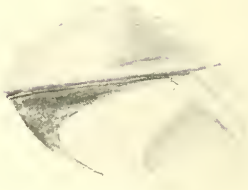

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Hawaiian Species of Helicina.

By Henry A. Pilsbry and C. Montague Cooke, Jr.

Helicina, in company with other genera of the smaller Hawaiian land shells, has so far received very little attention from the local collectors. The present paper is based mainly on a series collected for the Bishop Museum by the junior author.

The Hawaiian species are very seldom found alive in open or partly open country. They are usually collected in rather damp and heavily wooded sections of the islands. The only exception is *H. baldwini*, which occurs in a rather open belt of hala (*Pandanus odoratissimus*), on the fallen leaves.

The representatives of this genus, from the Hawaiian Islands, seem to belong to three groups. The characters upon which these groups are based, at present, are only those of the shell.

I. Group of *H. laciniosa*. In this group the spire is conic or depressed-conic, the periphery is more or less angular and the last whorl is flat or nearly flat above the periphery. This group contains: *laciniosa* and its numerous varieties, *oahuensis*, *sulculosa*, *nuuanuensis* and *baldwini*.

II. Group of *H. rotelloidea*. This group is characterized by the shells having a somewhat rounded periphery, the whorls are distinctly convex. The species belonging to this group are as follows: *rotelloidea*, *hawaiiensis*, *knudseni* and *kauaiensis*.

III. Group of *H. uberta*. In this group the periphery is rounded, the whorls are nearly flat, the spire rather high with distinctly convex outlines and the aperture is sometimes slightly contracted. The species belonging to this group are: *uberta* and its var. *magdalenæ*, *berniceia*, *lymaniana* and *juddii*.

Helicina oahuensis, n. sp.

Fig. 1.

The shell is lenticular, with the periphery acutely carinate, slightly sinuous and minutely crenulated by the growth-striæ, thin, slightly diaphanous, striate with lines of growth, with two or three faint impressed spiral lines on the upper portion of the whorls

and strongly impressed just above and below the peripheral keel. Color reddish alternating with somewhat zigzag light flammules, which are almost white at the periphery, base brownish, except around the callus where there are traces of reddish flammules. Spire low conical, apex acute. Suture lightly impressed, margined above. Whorls nearly 4, almost flat, the last two slightly projecting at the periphery; the embryonic nearly smooth; the last flat above the carinate periphery, slightly convex below, not descending in front. Aperture nearly triangular; outer lip thin, forming a straight line above the periphery, arcuate below. Callus whitish about the axis, the rest very thin, transparent and minutely punctate. Operculum wanting. Maj. diam. 5.0, total length 2.7 mm.

Oahu: Waianae Mountains and Mt. Tantalus (Cooke). The locality of the type specimen is, back of the Leilehua Ranch-house, Waianae Mts.

Type No. 14,911, Bishop Museum.

This shell has been referred to *H. sandwichiensis*, Soul., by various authors and collectors. Its nearest relative is *H. laciniosa*, Migh., var. *delta*, P. & C., from which it is easily distinguished by its much more depressed contour.

Helicina laciniosa Migh.

Helicina laciniosa Mighels, P. Bost. Soc., ii, 1845, p. 19. *Helicina laciniosa* Gould, U. S. Exp. Exp., Moll., pl. vii, fig. 108. *Helicina sandwichiensis* Souleyet, Voy. Bonite, Zool., ii, 1852, p. 529, pl. xxx, figs. 1–5.

Unfortunately we do not have before us a typical shell of this species, though some of its numerous varieties are the most abundant of the Helicinæ found on the Hawaiian Islands. Specimens which would be hard to separate from this species, except as varieties, occur on Kauai, Oahu, Molokai, Maui and Hawaii.

From Souleyet's description it would be hard to separate his species from *laciniosa* even as a variety. *H. bronniana*, Phil., and *H. dissotropis*, Ancey, have been retained as varieties. Both of these differ but slightly from Mighel's description. Probably the form described by Mighels is one of the extremely local forms and it does not seem to have been rediscovered by any of the later collectors. Gould's description (U. S. Exp. Exp., Moll., p. 99, pl. vii, fig. 108) agrees closely with that of Mighels. Unfortunately

the figure does not agree very closely with the description. Mighels gives the diameter as 3.8 mm; Gould's measurements are: axis 2.5, base 3.8 mm.

var. **bronniana** (Philipi).

Helicinia bronniana Philipi, Zeitsch. Malak., iv, 1847, p. 124. *Helicina rotelloidea* Pfeiffer, Conch. Cab., Helicina, p. 23, pl. iii, figs. 40-43.

This variety is decidedly larger than the typical *laciniosa*. Philipi does not mention any spiral lines. The flat whorls and the rotundate-angulate periphery bring his species very close to the typical *laciniosa*. This is probably one of the very local forms.

Philipi's measurements are: alt. 4.2, diam. 5.25 mm.

var. **dissotropis** (Ancey).

Helicina dissotropis Ancey, P. Malac. Soc. London, vi, 1904, p. 127, pl. vii, figs. 22, 23.

M. Ancey, in a note, says, "Surely not a variety of *H. sandwichiensis*, Souleyet, of which I have typical specimens from the Waianae Mountains, Oahu (D. D. Baldwin)." The shells distributed by Mr. Baldwin as *H. sandwichiensis* Souleyet are not this species—which equals *H. laciniosa* Migh.—but *H. oahuensis*.

In the variety *dissotropis* the shell is more compressed and flattened and the periphery is more angulated than in the typical form of *laciniosa*.

M. Ancey's measurements are: diam. 4.2, alt. 2.25, alt. apert. (oblique) almost 2 mm.

The habitat is: Oahu, Nuuanu (Thaanum).

var. **delta**, n. var.

Fig. 2.

The shell is somewhat lenticular, carinate at the periphery, striate with lines of growth, with 4–6 low and not very conspicuous spiral ridges grouped above and below the peripheral keel. Bright red, distinctly and closely marked with numerous zigzag yellowish white flammules. Spire depressed conic, apex subacute. Suture lightly impressed, margined above. Whorls 4½, nearly flat, the embryonic smooth, the penultimate slightly projecting, the last flat above the carinate periphery, slightly convex below,

not descending in front. Aperture oblique, semicircular-triangular, not contracted; outer lip with a thin edge. Callus thin, whitish about the axis, the rest transparent, minutely punctate. Operculum corneous, thin, minutely punctate.

Maj. diam. 4.4, total length 2.9 mm.

Kauai: Ēkaula, below Puukapele.

Type No. 14,901, Bishop Museum.

This variety somewhat approaches *H. oahuensis*. It is, however, quite closely related to *H. laciniosa*. This is the nearest relative to *laciniosa* so far reported from the island of Kauai.

var. **gamma,** n. var.

Fig. 3.

The shell is biconic, acutely carinate at the periphery, nearly smooth, finely striate with lines of growth, without spiral lines, but distinctly impressed just above and below the peripheral keel. Color light cinnamon, nearly uniform, overlaid with a thin yellowish cuticle. Spire depressed-conic, apex subacute. Suture simple. Whorls 4, nearly flat, the embryonic nearly smooth, the second and third slightly convex, the last flat above the carinate periphery, convex below, descending slightly in front. Aperture oblique, subtriangular, not contracted; outer lip with a thin edge. Callus thick and whitish about the axis, the rest very thin and transparent, minutely punctate. Maj. diam. 5.0, total length 3.5 mm.

Oahu: Ewa (Cooke), Wahiawa (Lyman, Cooke).

Type No. 14,902, Bishop Museum.

This is one of the most distinct of the varietal forms of *laciniosa*. The relatively high spire and pronounced carination easily distinguish it from the other varieties.

var. **beta,** n. var.

Fig. 4.

The shell is globose-conic, with the periphery rotundate-angulate, nearly smooth, faintly striate with lines of growth, encircled at and immediately below the periphery with three raised, rounded keels. Color a uniform dull claret, spire slightly eroded. Spire conic, with slightly convex outlines, apex slightly obtuse. Suture

faintly impressed, simple, indistinctly margined above on the third whorl. Whorls 4½, slightly convex, the embryonic slightly eroded, the last rotundate-angulate, slightly descending in front. Aperture oblique, nearly semicircular, not contracted; outer lip with a thin edge. Callus thick, minutely punctate. Operculum dull claret, minutely punctate. Maj. diam. 4.5, total length 4.0 mm.

Oahu: Kapalama (Lyman).

Type No. 14,903, Bishop Museum.

This variety differs not only in size and in its relative proportions, but also in its dull claret color which has not been observed in any of the other varieties of this species.

var. **alpha**, n. var.

Fig. 5.

The shell is globose-conic, with the periphery strongly angular, quite smooth, striate with lines of growth and encircled with 5–7 impressed spiral lines, the two most prominent being just above and below the peripheral keel. Color a nearly uniform light cinnamon red with a slight suffusion or spotting from incipient surface decay, sometimes broken by very indistinct lighter flammules. Spire straightly conic, apex rather acute. Suture scarcely impressed, indistinctly margined. Whorls nearly 4, almost flat, the embryonic very minutely transversely striate, the last nearly flat above the strongly angular periphery, very convex below it, slightly descending in front. Aperture oblique, subtriangular, not contracted; outer lip thin. Callus quite thick, whitish about the axis, the rest nearly transparent, minutely punctate. Operculum reddish corneous, thin, very minutely punctate. Maj. diam. 3.2, total length 2.6 mm.

Oahu: Mt. Tantalus (Cooke).

Type No. 14,904, Bishop Museum.

This variety comes nearer the true *H. laciniosa* in form and sculpture than any of the other varieties of this species mentioned herein. It differs in its higher spire and smaller size. It is intermediate between *H. laciniosa* Migh. and *H. sulculosa* Ancey.

Helicina sulculosa Ancey.

Helicina sulculosa Ancey, P. Malac. Soc. London, vi, 1904, p. 127, pl. vii, fig. 25.

This species and *H. laciniosa* Migh. var. *alpha* are very closely related. The spire of the former is more depressed, the whorls are slightly more convex and the aperture is more rounded.

This is the only species so far reported from the island of Hawaii. M. Ancey's measurements are: diam. 3.33, alt. 2.5, alt. apert. 1.5 mm.

Hawaii: Olaa (Thaanum).

Helicina hawaiiensis, n. sp.

Fig. 6.

The shell is depressed with a conical spire, periphery rounded, quite thin, nearly smooth, under a strong lens minutely striate with lines of growth and, in type specimen, with five fine raised spiral striæ, two above, one encircling and two below the periphery. Color a dull yellowish green interspersed with a few irregular light reddish flammules above. Apex somewhat acute. Suture simple, well impressed. Whorls 3⅔, convex, the embryonic minutely striate, the last rounded with the base somewhat flattened, slightly descending in front. Aperture elongate-semicircular, not contracted; outer lip thin. Callus small, thin, transparent, minutely granulose. Operculum whitish, thin, granulose. Maj. diameter 5.5, total length 3.7 mm.

Oahu.

Type No. 58,384, Phil. Ac. Nat. Sci.

This species approaches *H. knudseni* in form. Its larger size, the absence of forwardly descending wrinkles and the presence of raised spiral lines enable it to be easily distinguished from the Kauaian species. Its closest relative is *H. rotelloidea* Migh. The two differ considerably in size, color pattern, etc.

Helicina knudseni, n. sp.

Fig. 7.

The shell is depressed with a conic spire, the periphery rounded, quite thin, nearly smooth, minutely striate with lines of growth, under a strong lens these are intersected, almost at right

angles, by very fine, close, forwardly-descending wrinkles. Color light brownish-red, darker on the spire, interspersed with irregular, zigzag yellowish white flammules forming spots on the periphery, and absent on the base except close to the callus. Apex somewhat obtuse. Suture simple, well impressed. Whorls about 3¾, quite convex, slightly projecting above the suture, the embryonic nearly smooth, the last somewhat flattened above and below the rounded periphery, not descending in front. Aperture nearly semicircular; outer lip thin. Callus whitish about the axis, the rest transparent, thin, granular. Operculum punctate, of a light cinnamon color. Maj. diam. 4.9, total length 3.6 mm.

Kauai: Olokele (type loc.), Waiakoali (Cooke).

Type No. 14,905, Bishop Museum.

This species has nearly the same form as *H. rotelloidea* Migh. It is easily distinguished by its larger size, the absence of spiral striæ, and the peculiar sculpture of the forwardly descending wrinkles over the growth lines.

Helicina kauaiensis, n. sp.

Fig. 8.

The shell is subglobose-conic, with the periphery well rounded, quite thin, nearly smooth, under a lens minutely striate with lines of growth, with several (in the type specimen about eight) widely spaced, thin, raised spiral cuticular striæ, three above, one on, and the rest below the periphery, the upper striæ extended on the spire nearly to the embryonic whorls. Color orange-red, with distinct light yellow flammules at and above the periphery. Spire convexly conical, with the apex slightly acute. Suture simple, well impressed. Whorls 3¾, distinctly convex, under a lens the embryonic whorls are transversely striate, the last rounded, not descending in front. Aperture slightly oblique, semicircular, not contracted; outer lip thin. Callus slightly whitish about the axis, the rest very thin, transparent, very minutely punctate. Maj. diam. 3.2, total length 2.4 mm.

Kauai: The upper part of Milolii (Cooke).

Type No. 14,906, Bishop Museum.

This species recalls *H. rotelloidea* Migh., in form. It is slightly larger, darker colored, with more distinct flammules, higher spire, and is also distinctly marked with spiral cuticular striæ.

Helicina rotelloidea Migh.

Fig. 9.

Helicina rotelloidea Mighels, Proc. Bost. Soc., ii, 1845, p. 19.

The shell is depressed, with a low conoidal spire and a well rounded periphery, thin, nearly smooth, dull, under a lens showing minute lines of growth and two or three faint spiral lines above the periphery. Color a uniform dull cinnamon more reddish on the spire (sometimes of a uniform light greenish yellow). Spire convexly conoidal, apex subacute. Suture simple, well impressed. Whorls 3⅔, distinctly convex, at first slowly and regularly then rapidly increasing, the last wide, well rounded, convex below the periphery, hardly descending in front. Aperture quite oblique, semicircular, not contracted; outer lip thin. Callus thin, becoming thick and whitish about the axis, the outer portion transparent, of the color of the shell, very minutely punctate. Operculum very thin, whitish, minutely punctate. Maj. diam. 3.0, total length 2.0 mm.

Oahu: Nuuanu (Cooke). This species is somtimes terrestrial in habitat. It is usually found on growing plants two or three feet above the ground.

Type of the above description, No. 14,907, Bishop Museum.

Mighels' type is probably lost. Unfortunately the species is insufficiently described and there are no figures of authentic specimens of this species. Pfeiffer's figures (Conch. Cab., Helicina, pl. iii, figs. 40-43) undoubtedly refer to *H. bronniana* Phil. Mighels' measurements (2.5–5.8 mm.) include at least two species, the smaller of which has been chosen to represent the species.

The specimen selected differs from his description in the absence of "obscure light spots." These are, however, found in other specimens from another part of Nuuanu Valley.

H. rotelloidea is characterized by its small size, convex whorls and rounded periphery.

Helicina nuuanuensis, n. sp.

Fig. 10.

The shell is subglobosely conic, slightly angular at the periphery, thin, nearly smooth, minutely transversely striate and with four or five fine raised spiral striæ, of which two are above, the

rest below, the slightly angular periphery. Color of a uniform greenish yellow or cinnamon brown. Spire conoidal, apex obtuse. Suture simple, well impressed. Whorls 3¾, flatly convex, slowly and regularly increasing, the last flattened and sloping above the slightly angular periphery and very convex below it, gradually descending in front. Aperture oblique, semicircular, not contracted; outer lip thin. Callus thick and white near the axis, the rest very thin, of the same color as the shell, minutely punctate. Operculum very thin, of the same color as the shell and minutely punctate. Maj. diam. 2.9, total length 2.5 mm.

Oahu: Nuuanu, upper part (Cooke).

Type No. 14,908, Bishop Museum.

Nuuanuensis is easily distinguished from the other Hawaiian species. In size it approaches *H. rotelloidea* Migh., but differs by its higher spire, less convex whorls, the last of which is flattened above the inconspicuous peripheral angle. It is apparently most nearly related to *H. laciniosa* Migh.

Helicina berniceia, n. sp.

Fig. 11.

The shell is globosely depressed, with a rounded periphery, quite thin, smooth, minutely marked with growth-striæ. The spire is rather high, with convex outlines and a slightly conoidal summit. Suture simple, slightly impressed. Whorls 4, very slightly convex, regularly increasing, the last rounded, slightly flattened below, hardly descending in front. Aperture oblique, semicircular, not contracted; outer lip thin. Callus thin, smooth. Operculum wanting. Maj. diam. 3.5, total length 3.1 mm.

Kauai: Limahuli, fossil (Judd, Cooke).

Type No. 14,909, Bishop Museum.

This species is somewhat related to *H. laciniosa* Migh., though it lacks the spiral lines and the angular periphery. Its nearest relative appears to be *H. nuuanuensis*, from Oahu. From this species it differs slightly in size, in the convexity of the spire and whorls, and the lack of spiral lines. At present this species is only known in its fossil state.

This species is dedicated to Bernice Pauahi Bishop, in whose memory the Museum, which bears her name, was founded.

Helicina lymaniana, n. sp.

Fig. 12.

The shell is semiglobose, with the periphery rounded, quite thin, nearly smooth, not polished, minutely striate with lines of growth and with a few slightly raised longitudinal striæ on the last whorl. Color a pale dull red under a yellowish cuticle. Spire very convex. Suture well impressed, simple. Whorls about 4, slightly convex, regularly increasing, the last slowly but rather deeply descending in front, well rounded. Aperture contracted, very oblique, small, semicircular; outer lip slightly thickened, minutely duplicate above. Callus whitish, reddish towards the outer edge, thick, minutely punctate. Operculum wanting. Maj. diam. 3.0, total length 3.0 mm.

Oahu: Waialua (Lyman).

Type No. 14,910, Bishop Museum.

Another form from Waihiawa, Oahu, though slightly larger, undoubtedly belongs to this species.

Lymaniana is somewhat related to *H. uberta* Gld. Its smaller size and more globose form easily separate it from Gould's species.

Helicina juddii, n. sp.

Fig. 13.

The shell is semiglobose, with a flattened base and a rounded periphery, solid, nearly smooth, but under a lens fine growth-lines are seen intersected at right angles by fine, close, forwardly descending wrinkles. Spire elevated, with convex outlines. Suture simple, well impressed. Whorls 4¾, slightly convex, the last rather abruptly descending in front, rounded at the periphery and above, flattened below. Aperture contracted, semicircular, very oblique; outer lip thickened within, though thin at the edge, duplicate above the periphery. Callus very thick, smooth. Operculum wanting. Maj. diam. 4.8, total length 4.6 mm.

Kauai: Koloa beach, in a fossil state (Judd).

Type No. 14,898, Bishop Museum.

This species is easily recognized by its semiglobose form, flattened base, large size and by the minute corrugation of its sur-

face. It is only known, at present, from bleached specimens found on the Koloa beach.

So far this is the only representative of the group related to *H. uberta* from the island of Kauai.

Helicina uberta Gould.

Helicina uberta Gould, Proc. Bost. Soc., ii, 1847, p. 202. *Helicina uberta* Gould, U. S. Exp. Exp., Moll., p. 94, pl. vii, fig. 114.

Gould reported the habitat to be Maui and Oahu. The only locality from which typical forms are collected at present is in the Waianae mountains. Specimens from back of Leilehua, in the Waianae mountains, agree very closely with the type shell (No. 5516, Smithsonian Institution).

var. **magdalenæ** (Ancey).

Fig. 14.

Helicinæ magdalenæ Ancey, Bull. Soc. Malac. France, vii, 1890, p. 342.

The variety is only found on the Pauoa side of Mt. Tantalus. No representatives of the typical form or of the variety have been reported, so far, from the region between the Waianæ mountains and Mt. Tantalus.

The variety differs from the typical form in size, and in the former there is usually an impressed spiral line just below the periphery. A shell of the type form measures: maj. diam. 4.5, total length 3.8 mm.

The variety is from 4.9–5.6 mm. in diameter, while the total length is from 3.3–4.0 mm. The variety is usually of a redder color. Both the variety and the typical form are characterized by a thick, pinkish parietal callus.

Helicina baldwini Ancey.

Helicina baldwini Ancey, P. Malac. Soc. London, vi, 1904, p. 126, pl. vii, fig. 24.

This is the largest species so far reported from the Hawaiian Islands. It is chiefly characterized by its relative large size, depressed conical form which is angular at the periphery, and

by several faint impressed spiral lines, above, on and below the periphery. M. Ancey's type measured: maj. diam. 6.0, alt. 4.0 mm. A rather large specimen from the type locality measures: maj. diam. 7.6, total length 4.8 mm.

The species has only been reported from Kipu, Kauai.

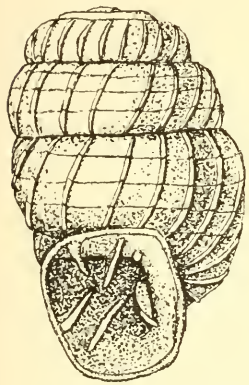
Presented August 23, 1907.

A New Species of Lyropupa from Hawaii

By C. Montague Cooke, Jr.

Lyropupa truncata, n. sp.

The shell is rimate, sinistral, cylindrical, dark brown, clathratulate, with about 14 well developed lamelliform costæ on the last whorl (between the costæ 5–8 minute striæ) and with 3–4 raised spiral striæ on each whorl. Spire cylindrical, apex almost flat, giving the shell a truncate appearance. Suture simple, depressed. Whorls 5, the embryonic without transverse costæ but with numerous minute close spiral striæ, increasing rather rapidly, the rest convex, clathratulate, increasing slowly, the last slightly narrower than the penultimate, with two distinct longitudinal depressions corresponding to the palatal plicæ. Aperture perpendicular, quadrate ovate, with 7 folds, viz.: three parietal lamellæ,—the angle lamella slightly arcuate, extending nearly to the margin of the peristome, the parietal a little deeper situated, strongly developed, and a minute dentiform infraparietal lamella; a deeply situated but well developed columella lamella; three nearly parallel palatal plicæ,—the lower palatal extending nearly to the peristome, the upper palatal more deeply situated and a very short deeply situated basal plica. Peristome continuous, slightly expanded. Length 2.6, diam. 1.66, length of ap. 1.1, diam. of ap. 1.0 mm.



Hawaii: Kohala Mts. (Thaanum).

Type No. 15,411, Bishop Museum Coll.

This is one of the most distinct species of *Lyropupa* so far reported. In fresh specimens this species is distinctly clathratulate, as are, also, *L. lyrata* Gld., from West Maui (*nec L. lyrata* (Gld.)

Ancey, from Hawaii) and *L. clathratula* Anc., from Hawaii. The transverse striæ are strongly developed, with cuticular margins which are easily broken. As in *L. clathratula*, the spiral striæ are cuticular and are probably deciduous. The apex is almost flat, giving the shell a somewhat truncate appearance. The aperture is furnished with more lamellæ and plicæ than any other species of the genus so far reported.

Presented June 27, 1908.

Three New Species of Amastra from Oahu

By C. Montague Cooke, Jr.

During the last few months Mr. Irwin Spalding has found a number of interesting forms of *Amastra*. Three of these are entirely distinct from any of the species already described. Some of the other forms do not agree with any description but may be referred, as varieties, to some of the spceies already described. It seems strange that all of the three species described here are found within five miles of Honolulu.

Amastra irwiniana, n. sp.

Fig. 3.

The shell is minutely (though distinctly) perforate, dextral, globosely conical, with slightly concave outlines, thin, distinctly irregularly and closely striate with lines of growth, not glossy, the upper whorls and the base of the last whorl light brown with a slightly yellowish tinge, the upper portion of the last whorl of a dark chestnut. Spire slightly concavely conic, apex acute. Suture simple, well impressed. Whorls 6¼, the embryonic slightly swollen, the fourth and fifth slightly flatter, the last convex, tumid, with an almost obsolete angle at the periphery, tapering towards the base. Aperture rather large, bluish within, in the form of a slightly oblique sector of a circle, very slightly oblique. Columella straight; columellar fold almost median, rather large,

thin and slightly oblique. Outer margin of lip thin, slightly thickened within, erect, regularly curved, forming an angle with the base of the columella; columellar margin thin, reflexed above the umbilicus. Umbilicus minute, semicircular. Length 11.2, diam. 7.2, length of ap. (diagonal) 5.9 mm.

Oahu: Summit of Lanihuli, at 2700 ft. (Spalding).

Type No. 16,633, Bishop Museum Coll.

This species is undoubtedly related to *A. breviata* Baldwin. It is, however, smaller, with a more acute and slightly concave spire, and the arrangement of its color is different.

A second specimen has the following measurements: length 10.8, diam. 6.9 mm.

Amastra spaldingi, n. sp.

Fig. 2.

The shell is imperforate, dextral, cylindrically ovate, somewhat thin, irregularly and faintly striate with lines of growth, the third whorl distinctly and diagonally striate, the third and fourth whorls having a distinct spiral thread just above the sutures, the first three whorls light brown with a yellowish tinge, the lower three of a uniform dark resinous chestnut. Spire subcylindrical, with slightly convex outlines, apex somewhat obtuse. Suture simple, hardly impressed. Whorls 6½, increasing somewhat regularly, the embryonic somewhat convex, the rest flatly convex, the last cylindrical, tapering gradually towards the base. Aperture subpyriform, bluish within, scarcely oblique. Columella nearly straight, hardly twisted; columellar fold basal, rather small, thin, oblique, flexuous. Outer margin of lip regularly curved, erect, thin, forming a slight angle with the base of the columella; columellar margin thin, appressed, adnate. Length 18.9, diam. 9.6, length of ap. (diagonal) 8.1 mm.

Oahu: Summit of Konahuanui, at 3300 ft. (Spalding).

Type No. 16,451, Bishop Museum Coll.

A. spaldingi is not closely related to any of the already described species. Its nearest congener is, probably, the species wrongly described and figured by Reeve as *A. ventulus* Fér.

(Conch. Icon., Achatinella, No. 31). It is much larger than any specimens of Reeve's species and more cylindrical in outline. The spiral thread on the third and fourth whorls is peculiar, as are the rather pronounced striæ on the third whorl.

A second specimen, in the Bishop Museum collection, is younger, with 6+ whorls. It is slightly more convex in outlines and measures: length 17.2, diam. 9.7 mm.

Amastra davisiana, n. sp.

Fig. 1.

The shell is perforate, dextral, subconic, with slightly convex outlines, obtusely and faintly angular at the periphery, with a somewhat flattened base, rather solid, nearly smooth, distinctly and almost regularly striate just below the sutures, slightly glossy, dark reddish brown, with an indistinct broad dark band just above the periphery and continued on the spire just above the sutures. Spire almost conic, apex very obtuse. Suture minutely crenulate, scarcely impressed, yellowish along its edge. Whole 6¾, the embryonic rather large (for the genus), the rest increasing slowly and very regularly, almost flat, the last descending slightly near the aperture. Aperture small, subquadrate, oblique, bluish within. Inner margin of the columella slightly diagonal, outer margin nearly straight; columellar fold nearly basal, strong, thick, slightly oblique. Outer margin of lip thin, slightly thickened within, nearly straight above, curved below, forming something of an angle with the base of the columella; columellar margin thin, reflexed above the umbilicus. Umbilicus small, semicircular. Length 16.5, diam. 9.2, length of ap. (diagonal) 7.0 mm.

Oahu: About a mile from the summit of Kouahuanui (Davis); summit of Konahuanui (Spalding).

Type No. 16,454, Bishop Museum Coll.

I know of no species to which this is at all related. It is entirely distinct from any of the other species of *Amastra*. The blunt apex and very regularly coiled and almost flat whorls are very peculiar. The single type specimen was originally collected

by Mr. Elmer Davis, about a mile from the summit of Konahuanui. Additional specimens were found later by Mr. Spalding at the summit. These are smaller, slightly darker and have about ¼ less whorls. One of these (No. 16,453, Bishop Museum) measures: length 14.4, diam. 8.5 mm.

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Presented June 20, 1908.

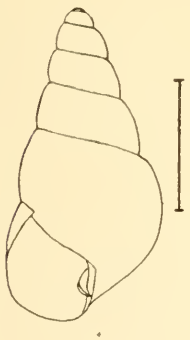
Amastra (Laminella) kuhnsi.

By C. Montague Cooke Jr.

Specimens of a *Laminella* from West Maui under the name of *Laminella erecta* Pease were kindly sent the Bishop Museum by Mr. D. Thaanum. The shells were, I think, identified by Mr. D. D. Baldwin. Lately the specimens were compared with Pease's description and were found to differ considerably from the description. As there is no description with which it agrees I venture to describe it as a new species. I have followed Mr. Sykes in placing *Laminella* as a subgenus of *Amastra*.

Amastra (Laminella) kuhnsi, n. sp.

The shell is minutely perforate, sinistral, elongately conical, nearly solid, minutely and irregularly striate with lines of growth (the striæ slightly stronger just below the sutures), the first four whorls glossy, the rest somewhat glossy, cinnamon brown (apex darker), with a few indistinct irregular zigzag transverse brown lines on the penultimate and last whorls. Spire elongately conic, apex obtuse. Suture minutely crenulate, slightly oblique, well impressed. Whorls 6, the embryonic smooth, convex, the rest increasing slowly and regularly, convex, the last somewhat rotundate, tapering towards the base. Aperture rather large, broadly subovate, oblique, whitish within. Columella nearly straight; columellar fold median, oblique, not strongly developed, thick, blunt. Outer magin of lip convex, erect, thin; columellar margin thin, adnate above, below free, reflexed over the umbilicus. Umbilicus minute, circular. Length 13.4, diam. 6.5, length of ap. (diagonal) 5.5 mm.



West Maui: Kahakuloa (Kuhns, Baldwin).

Type No. 15,142, cotypes 16,662, Bishop Museum Coll.

This species differs from *A. crecta* Pse., as all the specimens are sinistral and are minutely perforate. The brown epidermis covers the whole of the shell and is not fugacious as in all the other species of *Laminella*. The darker zigzag markings are in the epidermis and are, also, not fugacious. There is a straw-colored variety of which I have seen a single specimen.

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Presented July 3, 1908.

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OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF POLYNESIAN ETHNOLOGY AND NATURAL HISTORY

VOL. III — NO. 3

SOME NEW SPECIES OF AMASTRA.

BY

C. MONTAGUE COOKE, JR.

HONOLULU, H. I.
BISHOP MUSEUM PRESS
1917

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Some New Species of Amastra.

By C. Montague Cooke, Jr.

Nearly all the material treated of in the present paper has come to the Bishop Museum since the visit of Dr. Pilsbry to the Hawaiian Islands in 1913. Six of the species and varieties, found in the following descriptions have been taken alive: two of the species are only known from recently dead specimens: the rest (nineteen species and varieties) are described from specimens found in more or less recent Pleistocene deposits.

All the Holotypes of the following species and varieties are in the collection of the Bishop Museum. The color-terms used in the descriptions of the living species are taken from Ridgway's Color Standards and Nomenclature, 1912. Dr. Pilsbry's classification in the Manual of Conchology, Vol. XXI, has been followed and the proper position of each of the following species can be found by referring to the Systematic List of Amastræ on page 137.

The illustrations were prepared from photographs of the Holotypes. Figures 2 and 3 plate B and 3 and 7 plate C, were photographed by Mr. Dean H. Lake of the Museum Staff, the rest by Mr. R. K. Bonine.

Subgenus Kauaia.

Section Armiella.

A. ricei, n. sp.

Pl. C. Fig. 1.

The shell is imperforate, dextral, elongate, ovate-conic, solid; in fresh dead specimens the color is benzo-brown with a broad, yellowish white band below the sutures and a basal patch of the same color. Spire elongate, with convex outlines and an acute

apex. First embryonic whorl smooth and polished, slightly convex; the second flat with rather strong nearly straight uneven striæ. The post embryonic whorls are regularly and closely sculptured with coarse growth-wrinkles; the last two in addition having very faint close irregular, spiral striæ. The last whorl cylindrical, ascending rather rapidly just back of the peristome. Aperture rather long and narrow, its regularly curved outer margin furnished with a well defined lip-rib. Columella slender, nearly perpendicular, its outer margin impressed into the surface of the shell and furnished near its base with a low, blunt, oblique fold. The latter terminating gradually close to the outer margin of the columella.

Length 24.0, diam. 12.2, apert. 10.9 mm.; 6¾ whls. (Holotype)
" 24.7, " 13.0, " 10.6 " 6¾ "
" 23.9, " 12.2, " 10.0 " 6⅔ "

Kauai: In the Kauaiula branch of Milolii valley (C. A. Rice).

Type and cotype No. 41,993, paratypes No. 16,062, Bishop Museum.

Only five recently dead specimens were taken by Mr. Rice of which no two are exactly similar in the characters of the last whorl. In the type specimen and one other, the last whorl is rounded at the periphery. In a third specimen, there are three narrow parallel furrows on the periphery. In this specimen there is an oblique angle where these lines meet the margin of the aperture, which is flattened above. In the two remaining specimens there is a low oblique keel on the periphery and the last half of the last whorl is slightly shouldered just above the suture. The upper half of the peritome is slightly flattened.

At first glance this species appears to be closely related to *A. anthoni* especially as both species have almost the same color-pattern and the surface sculpture is somewhat similar. In *A. ricei*, however, the form and sculpture of the embryonic whorls is almost like that of *A. knudseni* and *A. kauaiensis*, though the striæ are not as coarse as in either of these two species. It is interesting to note that *A. ricei* is probably a connecting link between the sections *Armiella* and *Amastrella*.

var. r. **armillata,** n. var.

Pl. A. Fig. 8.

The shell is somewhat similar to *A. ricei* with the following differences; the fourth and fifth whorls are slightly swollen, and the surface is more coarsely but not as closely sculptured with growth-wrinkles. The periphery is distinctly carinated on the last whorl; the carina is margined along its upper edge by a deep narrow sinus. The lower half of the last whorl descends rather rapidly, with the carina appearing slightly above the suture. The outer margin of the aperture is distinctly modified by the carina. The upper portion being flattened, the lower evenly arched. The columellar fold is weak, thread-like, very oblique and deeply situated.

Length 22.7, diam. 12.1, apert. 10.0 mm.; 6½ whls. (Holotype)
" 24.6, " 12.0, " 10.0 " 7 "

Kauai: Milolii (A. F. Judd).

Holotype and cotype No. 41,994, Bishop Museum.

This variety is represented in the collection of the Bishop Museum by two dead specimens. It is not known whether they were from a Pleistocene deposit or simply old surface shells. The main interest attached to these specimens is the extreme development of the peripheral carina, so that the external margin of the aperture is modified to a greater degree than in any of the specimens of the typical form.

Subgenus CYCLAMASTRA.

(*Umbilicata Series.*)

A. juddii, n. sp.

Pl. B. Fig. 5.

The shell is perforate, dextral, conic, thin, nearly smooth, irregularly sculptured by distant blunt growth-wrinkles, in its fossil state of a dirty whitish color. Spire conic, with nearly straight outlines. Embryonic whorls worn, nearly smooth, convex; the following whorls slightly convex, the last large, convex,

tapering gradually to the base. Aperture large, very oblique, subquadrate in outline, with a very convex outer margin, and furnished with a thick broad lip-rib, obtusely angulate at the base of the columella and having a thick parietal callus. Columellar fold basal in situation, rather strong, subtransverse, terminating abruptly back of the columellar margin. Umbilicus small, cleft-like nearly closed by the thickened callus of the outer margin of the columella.

Length 11.5, diam. 6.9, apert. 5.5 mm.; 6 whorls. (Holotype) Kauai: (Judd).

Holotype No. 41,995, Bishop Museum.

This species is represented by the single type specimen in the collection of the Bishop Museum and two or three additional specimens in the Judd collection. It is entirely unlike any other species of *Cyclamastra* from Kauai. Its nearest relative appears to be *A. umbilicata* from Oahu. From this species it is most easily distinguished by its flatter whorls, greater proportional width, and broad aperture.

A. thurstoni, n. sp.

Pl. B. Fig. 2.

The shell is narrowly perforate, accuminately turreted, rather thin; spire with convex outlines, slowly tapering to the rather acute summit. The surface is rather strongly and almost regularly plicated, the plicæ are not sharp and gradually diminish in height towards the apex, stopping abruptly at the 2½ whorl. Whorls seven, the embryonic, convex, at first increasing rapidly then more slowly, almost smooth, very faintly striate. The fourth contracted, less convex than the remaining whorls; the last long, tapering towards the base, indistinctly angulate about the margin of the perforation. Umbilicus contracted slightly at its mouth, compressed, narrow. Aperture somewhat oblique, subrhomboidal, furnished just within the outer lip with a thick blunt callus. Columella narrowly triangular. Columellar fold basal in position, oblique, extending nearly to the margin.

Length 14.4, diam. 6.3, apert. 5.5 mm.

Oahu: Manoa, in excavation for Mr. R. Mist's house (Thurston, Oestergard and Cooke).

Holotype No. 40,631, Bishop Museum.

This extremely rare and interesting species is entirely distinc from any other species of AMASTRA. The Pleistocene deposits in Manoa are rather interesting as the shells do not occur in layers as in most deposits but in rather small pockets, containing from a few cc. to maybe half a liter. These pockets are literally full of shells, mostly in fragments, and belong to a number of genera.

A. thurstoni differs from all the other species of *Cyclamastra* by its proportionately long and slender spire and distinct plicate surface. It is not closely related to any of the known Oahuan species, but appears to be related to *A. fragilis* of Molokai, with which it agrees in having a narrow perforation and attenuated spire. It differs, however, in having more whorls, the spire is proportionately more attenuate and the surface more distinctly plicate.

A. gouveii, n. sp.

Pl. C. Fig. 3.

The shell is narrowly perforate, conic, very thin, translucent, irregularly striate, covered with a uniform dresden-brown epidermis, slightly lighter below the periphery. Spire narrowly conic, with an acute apex. Whorls nearly 7, covex; the embryonic distinctly very finely but regularly striate; the rest irregularly striate, the striæ arcuate, blunt; the last whorl rather short, rotundate, bluntly angulate at the margin of the perforation. Aperture rather broad, slightly oblique, with its outer margin almost regularly curved, hardly angulate at its junction with the columella, and with scarcely any thickening along the outer margin of the peristome. Columella straight, narrow, arched above the narrow compressed perforation, furnished near its base with a minute deeply seated oblique fold.

Length 12.4, diam. 6.2, apert. 5.0 mm. (Holotype)

Oahu: Wailupe, east side a little more than half way up the ridge, on the dead leaves of Ki (*Cordyline terminalis*)

Holotype No. 40,547, paratypes No. 40,548, Bishop Museum and in Gouveia collection.

A. gouveii is very closely related to *A. umbilicata* Pfr., and is undoubtedly derived from the same stock, being probably, a high altitude relative of this lowland species. There are a number of

more or less important characters which separate it from *A. umbilicata*. Its spire is longer and more conic in outline. Its last whorl is more rotund and shorter with a flatter base. Its perforation is decidedly narrower and is without the distinct ridge around its margin. Its aperture is wider with a more convex peristome and is decidedly less angular at its junction with the columella; its columellar fold, similar in position, is not as strong, thinner, slightly more oblique and more deeply seated.

The only other close relative from Oahu is *A. sola* Pils., to which it is very closely related. It differs by its longer and more conic spire, flatter and less excavated base. The embryonic shells of these two species are entirely different. Those of *A. gouveii* are longer, more acute, darker colored, much more distinctly striate, and have a proportionally narrower aperture than those of *A. sola*.

A. elephantina, n. sp.

Pl. B. Fig. 3.

The shell is openly perforate, globosely conic, rather thin for a shell of its size, in its fossil state white with the entire margin of the aperture pinkish. Embryonic whorls slightly convex, almost smooth, somewhat darker than the rest of the whorls. Subsequent whorls convex, the penultimate and last are distinctly distantly though somewhat irregularly striate, between the coarser striæ are numerous (6-10) fainter striæ. The last whorl is very large and tapers towards the base, it is contracted along the margin of the umbilicus forming a blunt rounded keel. The aperture is rather small, slightly contracted, with a thick heavy pinkish callus within its outer lip. Columella very broad, furnished near its base with a low thick slightly oblique fold. The parietal margin is covered with a rather thick pinkish callus.

Length 24.4, diam. 15.3, apert. 12.2 mm.; 6⅓ whorls.

Oahu: Waimano gulch (Thaanum).

Holotype No. 40,719, Bishop Museum. Paratypes in Thaanum collection and that of Acad. Nat. Sci. Phil.

The present species is very closely related to *A. antiqua*, Baldwin. It differs, however, in size, more globose outlines and form of aperture which is not as distinctly angulate at the base as

in Baldwin's species. The diameter of the perforation is less in proportion than in *A. antiqua* or its variety *A. a. kawaihapaiensis*.

Only four specimens of this species were taken by Mr. Thaanum in a very rich pocket of fossiliferous earth. The pocket contained about a bushel of earth and in it were thousands of shells and shell fragments.

A. modicella, n. sp.

Pl. A. Fig. 7.

The shell is openly perforate, dextral, thin, fragile. In its fossil state of a pale brownish-white. The embryonic whorls are minutely, though distinctly, striate, convex. The rest of the whorls are convex, sharply and irregularly striate with growth-wrinkles, becoming coarser on each succeeding whorl. Sutures rather deep. Aperture rather large and broad for a shell of its size, with a very convex outer margin, not distinctly biangular as in most of the species of this subgenus. The columella is narrowly triangular with a straight outer margin. Columella fold very weak, diagonal, and extending nearly to the base of the columella. Umbilicus minute, nearly circular, with a rounded edge.

Length 9.3, diam. 5.4, apert. 4.1 mm.; 5½ whls. (Holotype)
" 11.0, " 5.6, " 4.4 " 6 "

Hawaii: Waikii station, in the land of Waikoloa, about 6,000 feet elevation.

Holotype and cotype No. 41,969, paratypes No. 41,970, Bishop Museum.

This species is intermediate between *A. ultima* and *A. fragilis*, the latter from the island of Molokai. It differs from the former by its much smaller umbilicus, slightly more convex spire and the aperture is not as distinctly biangular, Besides the surface is rougher and more deeply sculptured with growth-striæ. It agrees with the latter species in the size of umbilicus and form of aperture. It differs, however, in its less attenuate spire, greater proportional breadth and more compact form.

The specimen from which the second set of measurements was taken is much larger than any of the other specimens and differs considerably from them. It is a loosely coiled shell with an indistinct suprasutural angle on the penultimate whorl. In this specimen the columellar fold is very weak. It is represented by a faint line which does not reach the margin of the columella.

A. umbilicata var. **pluscula,** n. var.

Pl. C. Fig. 2.

The shell is umbilicate. The umbilicus being decidedly wider than in *A. umbilicata;* broadly conic, rather thin, in its fossil state of a light brownish-red color and beginning on the back of the last whorl shading to an almost pure white at the margin of the aperture. The aperture is large, oblique, strongly convex along its outer margin and scarcely angulate below. Columella slightly oblique, furnished with a very minute oblique fold deep within. Umbilicus nearly circular furnished with a distinct spiral sulcus opposite the columellar fold.

Length 13.1, diam. 7.2, apert. 6.2 mm.; 6⅔ whls. (Holotype)
" 12.7, " 7.3, " 6.2 " 6½ "
" 11.4, " 6.4, " 5.2 " 6¼ "

Hawaii: Kapulehu, in the district of North Kona, about 18,000 feet elevation (Gouveia).

Holotypes and cotypes No. 41,978, paratypes No. 41,979, Bishop Museum and in the Gouveia collection.

This species is very common in its fossil state along the government road between Waimea and North Kona. A number of the specimens have such a fresh appearence that it does not seem possible that they have been very long dead. Most of the specimens were found in earth under lava blocks. It differs principally from *A. ultima* by its larger size and less convex whorls. This variety differs from typical *A. umbilicata morticina* not only by its larger umbilicus but also by its proportionally wider and larger aperture which is not distinctly angled below, and its much less developed columellar fold.

Subgenus AMASTRA.
Section AMASTRELLA.
(*Rugulosa Series.*)

A. remota, n. sp.

Pl. A. Fig. 3.

The shell is imperforate, dextral, solid, long-ovate, in its fossil state whitish below shading to a pale russet above and without

any indication of a light zone below the sutures. Spire with convex outlines, blunt. Embryonic whorls large, rounded, smooth, the first increasing rapidly, flattened above. The post-embryonic whorls are slightly convex, roughly sculptured with coarse, slightly oblique, irregular growth-wrinkles, and on the last two whorls encircled by numerous faint spiral striæ, the surface appearing under a strong lens to be minutely pitted; the last whorl cylindrical, tapering very gradually towards the base. The aperture is oblique, narrow, its outer margin furnished with a strong thick and blunt lip-rib. The columella is not as short as in *A. anthoni*, narrowly triangular, thick-callus. The columellar fold is low, blunt, diagonal, nearly basal in position and extends nearly to the margin of the columella.

Length 18.0, diam. 9.3, apert. 8.2 mm.; 6 whls. (Holotype)
" 18.9, " 9.3, " 8.0 " 6½ "
" 17.5, " 10.0, " 8.4 " 6 "

Kauai: Pleistocene deposits of the southwestern bluff of Kalalau valley about 100 feet elevation (Knudsen and Cooke).

Holotype and cotypes No. 41,996, paratypes No. 15,657, Bishop Museum.

A. remota is undoubtedly closely related to *A. anthoni*. It differs from Newcomb's species by its much larger and flatter embryonic whorls, more cylindrical and less conic outlines. There is no doubt that both species are derived from the same stock as the granular surfaces of both are almost identical though slightly coarser in the best preserved specimens of *A. remota*. In two specimens of this species, the aperture is very oblique and narrow, the last whorl descending very rapidly just before terminating at the peristome.

A. rugulosa var. **fastigata,** n. var.

Pl. B. Fig. 1.

The shell is minutely perforate or imperforate, dextral, long-conic, nearly solid, in its fossil state of a pale bluish-white. The spire is conic, with nearly straight outlines, pointed at the apex. The embryonic whorls are extended, convex, nearly smooth, polished. The rest of the whorls slightly convex, irregularly finely sculptured with rather close growth-wrinkles; the last sub-

cylindrical, in some cases, the surface showing an indication of indistinct malleation. The aperture is slightly oblique, rather narrow, with a regular convex outer margin, furnished with a thick strong lip-rib. Columella short, almost perpendicular. Columellar fold submedian in position, rather weak, terminating gradually close to the margin of the columella.

Length 12.5, diam. 6.7, apert. 5.8 mm.; 6½ whls. (Holotype)
" 13.6, " 7.2, " 5.7 " 6½ "
" 10.8, " 6.2, " 5.0 " 6¼ "

Kauai: Pleistocene of Koloa (Stokes); Mahalepu and Kipukai (Cooke).

Holotype and cotypes No. 41,997, paratypes No. 35,809, Bishop Museum.

Very abundant in the Pleistocene deposits under the sand dunes of all the above localities, associated with, but not as abundant as *A. similaris*. This form is for the present placed as a variety of *A. rugulosa*, though it may prove ultimately to be worthy of specific rank. The shells of this variety are for the most part slightly longer and considerably narrower than those of *A. rugulosa* or any of its varieties. The narrow extended embryonic whorls are also a distinctive character. This variety is geographically related to *A. r. normalis*, live specimens of which are still abundant on the northern slopes of the mountain range, which cut off the southern beaches from the rest of Kauai.

A. rugulosa var. annosa, n. var.

Pl. A. Fig. 9.

The shell is perforate, dextral, elongate-conic, rather thin, in its fossil state of a dull tawny olive color. The embryonic whorls are nearly smooth, the other whorls (due to the slightly worn state of all the specimens) are indistinctly obliquely and irregularly sculptured with growth-wrinkles. The aperture is diagonal, oblique, slightly contracted above, with a very convex outer margin, furnished with a thick lip-rib. Columella narrowly triangular, slightly bent backwards, its outer margin indistinctly thickened and united with the outer margin of the peristome by a thin parietal callus. Columellar folds weak, oblique, terminating

gradually far within the margin. Umbilicus rather small, semicircular in cross section.

Length 13.1, diam. 7.4, apert. 6.0 mm.; 6⅓ whls. (Holotype)
" 13.4, " 7.8, " 6.3 " 6¾ "
" 11.3, " 6.2, " 5.1 " 6 "
" 11.2, " 7.0, " 5.0 " 6¼ "

Kauai: Pleistocene deposits of Hanamaulu plains south of Wailua river (Dole and Cooke).

Holotype and cotypes No. 41,998, paratypes No. 19,476, Bishop Museum.

This extremely variable form is abundant in road cuttings on the coastal plain south of the Wailua river. There are several distinct forms found associated in the different deposits. The typical form described above might be considered a distinct species if it did not occur with numerous intergrades of other form which closely approach *A. rugulosa normalis*. A constant differentiating character between all these specimens of *annosa* and *normalis* is the very weak, oblique, deeply situated columellar fold of the former. Some of the specimens of *annosa* at first glance seem to belong to the subgenus *Cyclamastra* but the embryonic whorls are less convex than those of any species of this subgenus.

All the specimens of this variety are openly perforate except those of a rather rare narrow form. The third series of measurements given above is taken from one of the narrow imperforate examples; the first and second series of measurements are of typical examples; while the last is from a specimen which in form and position of the aperture closely approaches *normalis*. In the typical form the aperture is slightly diagonal and contracted above.

(*Flavescens Series.*)

A. flavescens var, **emortua,** n. var.

Pl. A. Fig. 6.

The shell is imperforate, conic, solid. In its fossil state of a very light vinaceous color, the surface nearly smooth, indistinctly and irregularly sculptured with growth-striæ. The spire is elongate-conic, with slightly convex outlines. The embryonic whorls

are very smooth, larger than those of *A. flavescens* and the first is slightly flattened on top. The rest of the whorls are uniformly slightly convex. The aperture is rather narrow, with a regularly curved outer margin which is scarcely thickened within. The columella is narrow, slightly twisted. The columellar fold is strong, oblique, and terminates abruptly close to the margin of the columella. There is a faint indication of an angle on the periphery of the last whorl.

Length 19.2, diam. 10.3, apert. 8.8 mm.; 6½ whls. (Holotype)
" 18.7, " 9.7, " 8.3 " 6½ "
" 18.0, " 9.2, " 7.6 " 6¾ "

Hawaii: Huehue in the district of North Kona, on the northwestern slopes of Hualalai about 1,700 feet elevation (A. Gouveia).

Holotype and cotypes No. 41,971, paratypes No. 41,972, Bishop Museum.

By its size and form this variety is easily separable from *A. flavescens* Newcomb. It is placed as a variety of Newcomb's species on account of its close relationship to *A. f. saxicola*. Paratypes of *saxicola* in the Bishop Museum collection are smaller, narrower and with less convex whorls.

A rather distinct race of *emortua* is found in the same deposit. In this race the whorls are slightly more convex, the surface glossy, and more strongly sculptured. The aperture is smaller and in most of the specimens there is an additional columellar fold above the usual one. The last series of measurements given above is of a specimen of this race. These two races are so intimately connected by intergrading specimens, that it seems unnecessary to separate them.

(*Melanosis Series.*)

A. whitei, n. sp.

Pl. C. Fig. 4.

The shell is imperforate, dextral, elongate-conic, nearly solid, very slightly translucent, light brownish-vinaceous, covered more or less by a cuticle of a dresden-brown color. Spire conic with slightly convex outlines and an acute apex. The embryonic whorls slightly lighter in color than the rest, very slightly convex,

almost smooth, indistinctly and irregularly striate; the later whorls convex, lusterless, sculptured with indistinct irregular growth-lines. The last is slightly angular at the periphery, the angle being continued on the penultimate whorl just above the suture. The aperture is somewhat narrow, the outer lip is regularly curved, slightly thickened within and margined with black. The columella is narrow, flattened and closely appressed to the shell. The columellar fold is rather large, oblique, terminating abruptly at the margin of the columella.

Length 12.6, diam. 6.8, apert. 5.5 mm.; 6 whls. (Holotype)
" 12.1, " 6.8, " 5.5 " 6 "

Hawaii: Kahauloa, elevation 3,250 feet; Keauhou elevation 2,000–2,400 feet (L. A. Thurston and T. C. White).

Holotypes No. 41,964, paratypes No. 39,642, Bishop Museum.

At first sight this AMASTRA appears to be a form of *A. conica*. It differs, however, from *A. conica* and its varieties (*gyrans* and *kohalensis*) in its thicker shell, closed perforation, besides the embryonic whorls are slightly more convex and the apex less pointed. Some of the specimens are more distinctly keeled at the periphery than the holotype. It is, however, in the immature specimens that the differences are more apparent. The shells are broader in proportion to their length and there is a strong distinct keel at the periphery. *A. whitei* has a much stronger, less oblique columellar fold than either *A. c. gyrans* and *A. c. kohalensis*.

An immature specimen with five whorls measures: length 9.3 diam. 5.0 mm. There is a minute perforation below, but the upper part of the columellar is appressed to the shell for more than half its length. *A. whitei* may ultimately prove to be related to *A. melanosis*, which Newcomb claimed to have been collected near the localities mentioned above.

A. conica var. **gentilis,** n. var.

Pl. A. Fig. 1.

The shell is imperforate or nearly so, elongate-conic, rather solid. In its fossil state the lower whorls are white, gradually becoming darker as they ascend. The spire is narrowly conic, with very slightly convex outlines, the whorls are nearly flat and separated by a very shallow suture. The aperture is rather narrow.

Columella very slender, furnished with a low oblique fold.

Length 13.4, diam. 6.9, apert. 6.0 mm.; 6 whls. (Holotype)
" 14.3, " 6.9, " 6.4 " 6 "
" 13.3, " 6.2, " 5.7 " 6 "

Hawaii: Waikii station, land of Waikoloa about 6,000 feet elevation.

Holotypes and cotypes No. 41,967, paratypes No. 41,968, Bishop Museum.

This variety differs from *conica* by its less convex whorls and absence of a perforation; from var. *gyrans* it differs by its thicker shell and less convex whorls, especially those of the embryonic stage. It is easily separated from var. *kohalensis* by the less convex outlines of its spire, shallower sutures, longer and proportionally narrower aperture, more solid shell and absence of a perforation. The supersutural keel of the penultimate whorl is not as strongly developed in *gentilis* as in *A. conica* and its two varieties. In an immature specimen of five and one half whorls, this keel is represented as a rather faint raised line.

A. spicula, n. sp.

Pl. A. Fig. 2.

The shell is imperforate or minutely perforate, ovate-conic, solid. In its fossil state of a glossy whitish color. The spire is conic with slightly convex outlines, contracted above. The embryonic whorls are almost flat, uniformly minutely striate; the third and fourth whorls are slightly more convex, more coarsely and less regularly striate with growth-wrinkles, the penultimate whorl is very irregularly striate with faint revolving striæ above gradually becoming malleate below. The last whorl is maleate with a distinct angle just above the periphery, the angle being continued just above the sutures of the fourth and fifth whorls. The aperture is rather large with a strongly curved outer margin. The columella is very narrow and slender, the upper portion of its outer margin being appressed to the shell. The columellar fold is rather weak, oblique, terminating rather abruptly near the margin of the columella.

Length 17.5, diam. 10.4, apert. 8.3 mm.; 6½ whls. (Holotype)
" 16.8, " 9.2, " 7.9 " 6½ "
" 18.9, " 10.1, " 8.5 " 7 "

Hawaii: Waikii station in the land of Waikaloa about 6,000 feet elevation (Judd).

Holotype and cotypes No. 41,965, paratypes No. 41,966, Bishop Museum.

This species does not seem to be closely related to any of the other species from Hawaii. Its pointed apex and the striation of the embryonic whorls place it in the *melanosis series*. *A. senilis* is undoubtedly the closest relative of this species known at present. The former is larger, wider and has a rather wide and open umbilicus.

The specimens of *A. spicula* which have been examined vary considerably in form from each other. They all agree, however, in having a closed or nearly closed perforation, and the degree of malleation is fairly constant. The sharp and pointed apex is by far the easiest character by which we can recognize this species. The first specimens were found by Mr. Judd, and it is probably not very abundant as only nine examples have been examined.

Immature specimens of about five whorls are either perforate or imperforate. In perforate specimens the columella is straight and narrow and furnished with a low oblique fold. In imperforate specimens the columella is slightly twisted and is furnished with a low oblique fold. Immature specimens are distinctly angled or carinate at the periphery.

A. viriosa, n. sp.

Pl. C. Fig. 6.

The shell is openly perforate, ovately conical, thick; the color of the cuticle is brussels brown, the under-color of the last whorl is pale olive-buff, the rest of the whorls being of a vinaceous-fawn. The upper part of the spire is almost straightly conic; the penultimate and last whorls are rather strongly convex, slightly shouldered above. The embryonic whorls are nearly flat, almost smooth, much darker than the rest of the whorls; in young specimens, under a strong lens, they are very minutely and almost regularly striate. Later whorls are coarsely irregularly striate and in some specimens the last whorl is more or less irregularly malleate. The aperture is rather small for a shell of its size, somewhat contracted above and without a distinct thickening along the outer lip. The

columella is slightly oblique, bent backwards below and flattened above the perforation. The columellar fold is rather weak, oblique, submedian in position and does not quite reach the margin of the columella.

Length	20.6,	diam.	11.7,	apert.	8.4	mm.; 7	whls. (Holotype)
"	20.0,	"	12.3,	"	9.0	" 7	"
"	20.5,	"	12.0,	"	9.4	" 7	"
"	18.0,	"	11.8,	"	9.2	" 6⅔	"

Hawaii: Kahauloa and Kealakekua elevation 4,360 feet and near boundary between Keokea and Kiilae elevation 3,700 feet (L. A. Thurston and T. C. White); Keei elevation 2,950 (A. F. Judd).

Holotype No. 41,963, cotypes and paratypes No. 39,661, Bishop Museum.

This interesting species was first collected by Mr. Judd in February, 1915. His material consisting of a single live immature specimen and a few adult dead and bleached specimens. During August of the same year, Messrs. Thurston and White, collected a fine series of this species at the type locality and a few additional specimens at the second locality mentioned above.

A. viriosa is unlike any species so far reported from Hawaii. Its nearest relative is probably the extinct *A. senilis* from Waimea. The latter is a larger species, much more roughly sculptured and has a larger perforation, besides being much broader in proportion to its length.

An immature specimen with four whorls is broadly conic, with a distinct peripheral angle. It measures length 9.1, diam. 8.4 mm. The embryonic whorls are very finely and regularly striate and there is an indication of three slightly raised spiral striæ. The post embryonic whorls are smoother and glossier than the embryonic. The umbilicus is very distinct about half a mm. in diameter and obliquely angled along its margin. The columellar fold is oblique, broad and low and extends nearly to the margin.

A. fragosa, n. sp.

Pl. A. Fig. 4.

The shell is narrowly umbilicate, dextral, conic, very thin, in its fossil state of a pale dirty white. Spire acutely conical, contracted above, with slightly concave outlines and a very acute apex.

The embryonic whorls are elongate, nearly flat, very faintly and minutely striate. The following whorls are indistinctly flattened above, convex below and indistinctly shouldered above the sutures, rather irregularly sculptured with oblique coarse growth-wrinkles. The last whorl is rounded, tapering towards the base and slightly contracted around the umbilicus. Aperture somewhat oblique, contracted slightly above, with its outer margin thin and regularly strongly arched. Columellar narrowly triangular, its inner margin slightly oblique, the outer margin thin and slightly arched above the umbilicus. Columellar fold not strong, nearly transverse, terminating very gradually at the outer margin of the columella. Umbilicus subcircular, its margin rounded and slightly contracted, enlarged within.

Length 13.7, diam. 8.0, apert. 5.6 mm.; 7 whls. (Holotype)
" 11.8, " 7.2, " 5.2 " 6½ "

Hawaii: Pleistocene at Kapulehu, about three miles north of Huehue and nearly the same elevation (A. Gouveia).

Holotype No. 41,976, paratypes No. 41,977, Bishop Museum.

This species is closely related to the following *A. pagodula*. Immature specimens of both species are similar though the adults have an entirely different appearance. In an immature specimen of *A. fragosa* there is a distinct peripheral keel not quite as strongly developed as in specimens of *A. pagodula* of about the same age. The immature specimens of both species are quite separable as the spire of *A. fragosa* is longer, sharper and slightly concave-conic. In some of the adult specimens of this species there is a slight tendency to form an indistinct angle at the periphery. When this character is present, the margin of the aperture is not modified as the angle disappears before reaching the aperture.

Embryonic specimens of both species exhibit about the same characters. Those of *A. pagodula* are slightly broader in proportion to their length the whorls increasing more rapidly and not as compact or closely coiled as in *A. fragosa*.

A. pagodula, n. sp.

Pl. B. Fig. 4.

The shell is narrowly umbilicate, dextral, conic, thin, in its fossil state of an ochraceous-orange on the upper whorls, the last

lighter colored shading to a broad white patch behind the peristome. Spire conic, with an acute apex and almost straight outlines. Embryonic whorls somewhat extended, flatly convex, the first smooth and polished, the second minutely closely striate. The following whorls are nearly flat, obliquely sculptured with rather coarse irregular growth-wrinkles. The last whorl is short, strongly carinate (the carina appearing above the suture of the last two whorls), with a flattened base, somewhat contracted about the umbilicus. The carina is slightly granulose, flattened below and its lower margin being bordered by a shallow sulcus. The aperture is small, very oblique, distinctly contracted above, nearly quadrate, in outline, the outer margin modified by the carina forming an obtuse angle; above the carina the margin is somewhat flattened, below regularly slightly arcuate, forming an angle with the base of the columella and furnished with a thin delicate lip-rib. The columella is narrowly triangular, its inner margin slightly oblique, the outer margin thin, semierect. Columellar fold large, nearly basal in position, subtransverse, ending abruptly at the outer margin of the columella. The umbilicus is nearly circular, with a rather acute, slightly contracted margin, wider within.

Length 10.9, diam. 7.4, apert. 4.6 mm.; 6 whls. (Holotype)
" 8.7, diam. 7.3, apert. 4.6 " 5½ "

Hawaii: Pleistocene at Huehue about 1,800 feet elevation (A. Gouveia, L. A. Thurston); Puwaawaa (A. Gouveia).

Holotype and cotypes No. 41,974, paratypes No. 41,975, Bishop Museum.

This remarkable species is provisionally placed in *Amastrella* though it and *A. fragosa* might appropriately form the nucleus of a new section or subgenus. Except for the presence of an umbilicus *A. pagodula* appears to be a diminuative *A. kauaiensis*. In some of the specimens there is a slight concavity to the spire. Immature specimens have a much stronger peripheral keel than adults. Some of the specimens appear to have died only recently as the color is antique brown with a broad whitish basal patch about the umbilicus. The embryonic shells are biconic, angled at the periphery and openly perforate. The columellar fold is minute, thread-like, oblique and submedian in position. The specimen from which the second series of measurements was taken, though considerably shorter and having half a whorl less than the type, is an adult shell with a well-defined lip-rib slightly more developed than that of the type. [238]

Section METAMASTRA.
(*Reticulata Series.*)

A. sericea var. **anaglypta,** n. var.
Pl. C. Fig. 9.

The shell is imperforate, dextral, globosely-conic, solid, roughly sculptured with close narrow growth-wrinkles, above the periphery the striæ are interrupted at close intervals by numerous fine revolving furrows, color bay, with a broad lighter colored indistinct band just below the sutures of the last and penultimate whorls and beginning at the periphery shading into an isabella color near the columella. Spire with convex outlines; the whorls convex, separated by rather deep sutures. The embryonic whorls very finely and closely striate and without spiral furrows. The last whorl rotund, convex, tapering gradually towards the base, smoother and without spiral furrows below the periphery. Aperture narrow, with a strongly convex outer margin furnished with a thin lip-rib, and with a very deep narrow sinus below the columellar fold. Columellar short, twisted, terminating abruptly. Columellar fold rather strong, oblique, situated at the base of the columella and terminating abruptly at the outer margin of the columella.

Length 14.5, diam. 9.2, apert. 7.3 mm.; 6¼ whls. (Holotype)
" 17.0, " 9.5, " 8.1 " 6½ "

Oahu: Punaluu on the trail to Kaliuwaa just below the summit of the ridge (Spalding, Thaanum, Cook).

Holotype No. 41,985, cotype No. 41,986, paratypes No. 19211, Bishop Museum.

This form is provisionally located as a variety of *A. sericea*. There can be no doubt that it is quite closely related to Pfeiffer's species. Its chief difference is that there are more whorls in the variety. An immature specimen with just six whorls measures nearly 14 mm. in length. This variety, with *A. sericea*, is closely related to *A. badia* and *A. undata*. The character of the surface sculpture of the post embryonic whorls is nearly the same in all four forms. The embryonic whorls of *anaglypta* are more finely striate than those of *A. undata* or *A. badia*. *Anaglypta* is easily separated from these two species by its smaller size, more convex whorls and entire absence of an undulating color-pattern.

A. montivaga, n. sp.

Pl. C. Fig. 5.

The shell is perforate or imperforate, dextral, thin, nearly smooth, faintly striate with growth-wrinkles, just below the sutures there is a shallow sulcus which is transversely interrupted by numerous strong striæ which are slightly bent backwards, color chesnut with a yellowish zone around the columella. Embryonic whorls convex, faintly and irregularly striate with growth-wrinkles. The following whorls slightly convex, with a distinct shoulder just above the sutures. The last whorl indistinctly angulate just above the periphery. Aperture slightly diagonal, its outer margin slightly flattened above, curved below, edged with black and furnished with a very thin lip-rib, and forming with the base of the columella a broad sinus. Columella short, narrow, its outer margin straight above, angled just outside the columellar fold. Columellar fold basal in position, not strong, thin, terminating somewhat gradually close to the outer margin of the columella. Umbilicus (when present) minute, cleft-like.

Length 12.4, diam. 7.3, apert. 5.7 mm.; 5¾ whls. (Holotype)
" 13.2, " 7.3, " 6.0 " 6 "

Oahu: Top of Maunakope, the peak as the head of the western Kalihi ridge (A. Gouveia).

Holotype and cotype No. 41,988, paratypes, No. 41,098, Bishop Museum, also in Gouveia collection.

A. montivaga is undoubtedly a dirivative of *A. textilis*. It differs from the latter species by its smaller size, thinner shell, more convex whorls (which are shouldered below), deeper sutures, etc. A specimen of *A. textilis* from the same locality measures length 16.0, diam. 8.2, apert. has 6¼ shorls. The penultimate whorl of *A. montivaga* is slightly shouldered just above its suture but the rest of the whorls do not show this character. In some of the specimens of *A. montivaga* the yellowish zone occupies the whorl of the shell below the periphery.

A. paulula, n. sp.

Pl. B. Fig. 6.

The shell is perforate, dextral, ovate, in its fossil state very light brown, rather thin. Outlines of the spire convex, with an

obtuse summit. Embryonic whorls increasing very rapidly, convex, smooth, under a lens showing no sculpture. The rest of the whorls are convex, separated by a very shallow suture, sculptured almost regularly by fine thin growth-wrinkles. The last whorl large, rotund. Aperture oblique, broad, its outer margin very convex and furnished with a delicate lip-rib. Columella narrowly triangular, slightly oblique, with a concave inner margin, its outer margin erect and straight. The columellar fold strong, nearly transverse, terminating rather abruptly close to the outer margin and near the base of the columella. Umbilicus distinctly open, cleft-like.

Length 9.2, diam. 5.4, apert. 4.3 mm.; 5⅔ whls. (Holotype)
" 9.8, " 5.4, " 4.4 " 5¾ "
" 8.9, " 5.2, " 4.4 " 5½ "

Oahu: Pleistocene of Malaikahana (type locality) (Spalding, Cooke); Kaipapau (Cooke).

Holotype and cotypes No. 41,982, paratypes No. 41,005, Bishop Museum.

This is the smallest known species of AMASTRA from Oahu. Its nearest relative seems to be *A. gulickiana* also from Oahu but found further south. *A. paulula* is easily separated from this species by its much narrower form. It is most easily distinguished from the rest of the Oahuan Amastræ by its small size and proportionately large and almost smooth embryonic whorls. Embryonic shells are of a light horn color with the initial whorl slightly whiter, the largest specimens have about two and one half whorls. They are slightly obliquely angled at the periphery. Above the angle the whorls are very minutely and irregularly striate with growth-wrinkles. The striæ are short extending from the angle to near the middle of the whorl.

A. praeopima, n. sp.

Pl. C. Fig. 8.

The shell is perforate, dextral, globose, very thin and transparent, of a uniform dull brussels-brown color, without a deciduous cuticle. Spire short, obliquely triangular, with slightly convex outlines. The embryonic whorls convex, the first smooth, increasing rapidly, the rest increasing more slowly, minutely transversely

sculptured with rather fine sharp striæ and encircled by about six narrow parallel furrows. The following whorls distinctly marked with almost regular close transverse growth-wrinkles. The last whorl large, swollen, rotund. Aperture very large, more than half the length of the shell, slightly oblique, with a very convex outer margin which is slightly thickened near the base of the columella. Columella straight, narrow, its outer margin free and arched over the perforation. Columellar fold basal in position rather strong, slightly oblique, terminating very abruptly close to the margin of the columella. Perforation narrow, cleft-like.

Length 10.7, diam. 7.8, apert. 6.1 mm.; 5 whls. (Holotype)
" 12.7, " 8.6, " 6.7 " 5½ "

Oahu: Waiahole at the crest of the Koolau range where the trail crosses the ridge (Cooke).

Holotype No. 41,983, cotype No. 41,984, paratypes No. 23,590 and 23,612, Bishop Museum.

The latter measurements given above are of an old dead shell. In this specimen the columella is bent obliquely backwards, the outer margin of the aperture is furnished with a thick strong lip-rib and there is a thick parietal callus. The characters of the embryonic whorls given above were taken from an immature shell with four whorls. In this specimen there is an oblique angle at the periphery. The columella is straight and the columellar fold is more centrally placed than in adult shells. *A. praecopima* is easily distinguished from all the other Oahuan species of AMASTRA. Its closest relative is undoubtedly *A. gulickiana*. The latter has, however, a thicker and less globose shell, much less distinctly and sharply striate and the columella is shorter.

A. forbesi, n. sp.

Pl. B. Fig. 8.

The shell is imperforate, *sinistral*, elongate-conic, thin, in its fossil state pure white. Outlines of the spire regularly, slightly convex, summit rather sharp. Embryonic whorls slightly convex, indistinctly minutely striate. The rest of the whorls slightly convex, finely striate with growth-wrinkles. The last whorl elongate, subcylindrical, rather coarsely striate, descending rapidly near the aperture, forming a rather oblique suture. The aperture is rather

small, narrow, deeply curved below the columellar fold, its outer margin regularly curved and furnished with a strong thick lip-rib. Columella short and broad. Columellar fold not especially strong, rather oblique and terminating gradually just within the margin of the columella.

Length 14.3, diam. 6.9, apert. 6.1 mm.; 6 whls. (Holotype)
" 13.5, " 6.4, " 5.6 " 6 "

Oahu: Pleistocene of Makua in the Waianae mountains (C. N. Forbes).

Holotype and cotype No. 41,980, Bishop Museum.

The material on which this species is based consists of two whole adult specimens and the lower portion of two additional specimens. All the specimens were taken by Mr. Forbes in a single pocket in sand deposits along the railroad track north of Makua. On a later visit by Mr. Forbes and the author, no additional specimens were found though all the exposed surfaces of the sand pockets along the track were carefully gone over. These pockets consist of beach sand covered by talus. Specimens of *Endodonta*, *Lyropupa*, *Succinea*, *Leptachatina* and *Helicina* are very abundant in these pockets, especially of the two last genera.

A. forbesi is easily distinguished from *A. thaanumi* and *montaguei* by its more extended embryonic whorls, narrower outlines, etc. It is separated from *A. elongata* Newc. by its blunter apex and greater length with less number of whorls. From the characters of the shells in Newcomb's description and the fact that he distributed Mauian shells under the name of *A. acuta* (= *elongata*) we are safe in doubting that Newcomb's species ever came from Oahu.

Section AMASTRA, s. s.
(*Magna Series.*)

A. hitchcocki, n. sp.
Pl. C. Fig. 7.

The shell is imperforate, conic-ovate, large, in its fossil state white. The spire is conic in outline above with slightly convex outlines below. The embryonic whorls conic, very finely striate, outlines of the five earlier whorls nearly straight, the two lower convex. The last whorl is rounded tapering towards the base, with very coarse irregular growth-striæ, especially near the aper-

ture, and indistinctly malleate. Aperture not large. Columella nearly straight, furnished with a rather strong slightly oblique fold.

Length 39.0, diam. 21.3, apert. 16.5 mm.; 7¾ whls. (Holotype)

Molokai: Mauna Loa on the southern slope between the top and Pohakuloa (Hitchcock); Hinanaula (G. P. Cooke); in various localities near the north shore from the shifting sands on the northern slopes of Mauna Loa to near Puukapele (Cooke); also collected on the north shore of Molokai (Bryan).

Holotype No. 41,962, paratypes No. 40,356, Bishop Museum.

The original specimen of this species was collected by Mr. D. H. Hitchcock, in May, 1913 and consisted of the aperture and a portion of the last whorl. On four trips to Molokai, the writer tried to relocate the original fossil bed but was unsuccessful. In December, 1914, Mr. G. P. Cooke, found a number of examples at Hinanaulua on the northern coast of Molokai. Unfortunately, the only whole specimen was not quite mature. During March, 1915, the writer spent about three weeks on Molokai, collecting for the most part from the fossil beds of the northern coast from the northwest point of the island to near Puukapele. A number of broken and immature specimens were taken and in addition to these two fine adults. One of these serves as a type of the species and came from the second valley west of Puukapele.

A. hitchcocki is closely related to *A. violacea* but differs in its much greater size, rounded aperture and coarser striæ. Some of the specimens of *A. v. wailauensis* are nearly as large as a *hitchcocki* but the two are easily separable as the outlines of the latter are more conic, the aperture is wider and more rounded, the surface more roughly striate and the columellar fold is stronger and less oblique. The specimens of this species, from the shifting sands and near the northeast base of Mauna Loa, are much smaller than those from the deposits east of Moomomi. An adult specimen from Kulainawawae measures length 32.3, diam. 18.0, apert 14.4 mm.

(*Pullata Subseries.*)

A. uniplicata var. **vetuscula,** n. var.

Pl. A. Fig. 5.

The shell is minutely perforate or imperforate, dextral, conic-cylindrical, solid, in its fossil state white. Spire convexly conic,

contracted above, with a rather sharp point. Embryonic whorls costate, carinated above the suture. The intermediate whorls striate, the last half of the penultimate and the last whorl distinctly malleate, with long narrow obliquely descending facets. The last whorl is rather long, subcylindrical, tapering very gradually to the base. Aperture subpyriform the outer margin slightly flattened, lip-rib strong. Columella narrow, nearly straight, appressed to the shell for nearly its whole length. Columellar fold strong, oblique, tapering gradually and nearly reaching the margin of the columella. The umbilicus when present is minute, cleft-like.

Length 18.2, diam. 9.0, apert. 8.0 mm.; 6¾ whls. (Holotype)
" 20.9, " 9.6, " 7.8 " 7½ "
" 18.5, " 8.6, " 7.5 " 6 "

Molokai: Pleistocene of the shifting sands north of Mauna Loa and directly south of Laina where the pipe line crosses the shifting sands (type locality), Kalainawawae, Moomomi, Hinanaulua and Puukapele (Cook).

Holotype and cotypes No. 41,992, paratypes No. 40,102, Bishop Museum.

A very few imperfect specimens were found by Pilsbry and Cooke in 1913 at Moomomi where this variety is extremely rare. Further west, especially in the shifting sands, it occurs more abundantly but is not a common species in any locality. It has been found sparingly in all the known fossil deposits from Puukapele west to the shifting sands. This variety is readily separated from the typical form by its less tumid last whorl, more cylindrical form and malleate surface. The columellar fold is weaker and does not terminate abruptly. *A. u. vetuscula* may on later examination prove to be of specific rank. It differs from all the specimens of *A. uniplicata* in the collection of the Bishop Museum but none of these are as narrow as the figure of Hartman's specimen.

(*Assimilis Series.*)

A. mirabilis, n. sp.

Pl. B. Fig. 9.

The shell is imperforate, *sinistral*, ovately-conic, the outlines of the spire nearly straight above, convex below. In its dead

state the last two whorls are white, becoming darker above, the apical whorls being of a dark reddish-brown. In two specimens there are traces of a thin dark greenish-brown epidermis. Embryonic whorls flattened, the first nearly smooth, the next distinctly costate, the costæ ending in a carina which is situated well above the deep suture. The rest of the whorls are quite regularly sculptured with fine growth-striæ The last whorl large, rounded. Aperture very oblique, large, nearly one-half the length of the shell, its outer margin quite convex and furnished with a distinct lip-rib. Columella short and broad, with its outer margin closely appressed to the shell. Columellar fold strong, nearly median in position, subtransverse and terminating abruptly close to the margin of the columella.

Length 14.5, diam. 8.7, apert. 7.1 mm., 6 whls. (Holotype)
" 15.8, " 9.0, " 7.3 " 6¼ "
" 15.7, " 9.2, " 7.2 " 6¼ "

East Maui: Just below Kaupo gap along the trail, about 5,000 feet elevation (Meinecke) (communicated by D. Thaanum), (Cooke).

Holotype No. 41,990, cotypes No. 41,991, paratypes No. 38,533, Bishop Museum, also in Mr. Thaanum's collection.

This species is undoubtedly a reversed form somewhat distantly related to species of the series of *A. assimilis*. It agrees closely to the species of this series in the form and surface sculpture of the embryonic whorls. It probably has no close relationship with the numerous Mauian species belonging to the section *Heteramastra*. In immature specimens there is a distinct oblique angle at the periphery. In a single specimen there are indistinct spirally descending facets on the last whorl. *A. mirabilis* is undoubtedly related to *A. farcimen*. It differs considerably in size, compactness and greater proportional diameter. The spire of *A. mirabilis* is contracted and in outline shows a much more acute angle than that of *A. farcimen*. Unfortunately the latter species is entirely unknown to modern collectors. The finding of *A. mirabilis* indicates that Dr. Pilsbry was right in placing *A. farcimen* in the Mauian fauna.

Section HETERAMASTRA.

A. flemingi, n. sp.

Pl. B. Fig. 7.

The shell is indistinctly rimate, sinistral, oblong-turrite, in its fossil state whitish. The spire is elongate, faintly contracted above, with slightly convex outlines. The embryonic whorls are regularly and finely striate, the rest rather smooth with few distinct growth-wrinkles, slightly obliquely angled above the oblique sutures from the penultimate to the neanic whorls. The last whorl elongate, subcylindrical, tapering gradually to the base and showing no trace of a supraperipheral angle. The aperture is narrow, distinctly biangular, with its outer margin regularly curved and furnished with a strong lip-rib. The columella is straight with its outer margin closely appressed to the shell, except at its base. The columellar fold is rather strong, subbasal in position, subtransverse, terminating gradually near the margin of the columella.

Length 13.7, diam. 6.0, apert. 5.2 mm.; 6¾ whls. (Holotype)

East Maui: Pleistocene of Kanaio, about 2,000 feet elevation, two miles east of Ulupalakua (D. Fleming).

Holotype No. 41,989, paratypes No. 40,063, Bishop Museum.

Only three specimens of this interesting species were taken by Mr. Fleming. The type is perfect but the other two specimens are quite badly broken. *A. flemingi* occupies a position between *A. læva* and *A. hutchinsonii* and appears to be more closely related to the former than the latter. It not only larger than *A. læva* but is proportionally narrower and its surface is not so roughly striate, besides the aperture is distinctly biangular. *A. flemingi* differs from *A. hutchinsonii* by its more convex outlines, flatter more compact and closer coiled whorls, narrower and biangular aperture, etc. It does not seem to be in any way related to *A. subsoror auwahiensis*, the latter belonging to the *soror subseries*.

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PLATES

EXPLANATION OF PLATES.

PLATE V. (A)

FIGURE		PAGE
1.	Amastra conica var. gentilis. Hawaii. x 2.45	15
2.	" spicula. Hawaii. x 1.75	16
3.	" remota. Kauai. x 1.7	10
4.	" fragosa. Hawaii. x 2.2	18
5.	" uniplicata var. vetuscula. Molokai. x 1.2	26
6.	" flavescens var. emortua, Hawaii. x 1.65	13
7.	" modicella. Hawaii. x 3.3	9
8.	" ricei var. armillata. Kauai. x 1.35	5
9.	" rugulosa var. annosa. Kauai. x 2.65	12

PLATE VI. (B)

1.	Amastra rugulosa var. fastigata. Kauai. x 2.65	11
2.	" thurstoni. Oahu. x 2.2	6
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PLATE VII. (C)

1.	Amastra ricei. Kauai. x 1.3	3
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3.	" gouveii. Oahu. x 2.75	7
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5.	" montivaga. Oahu. x 2.55	22
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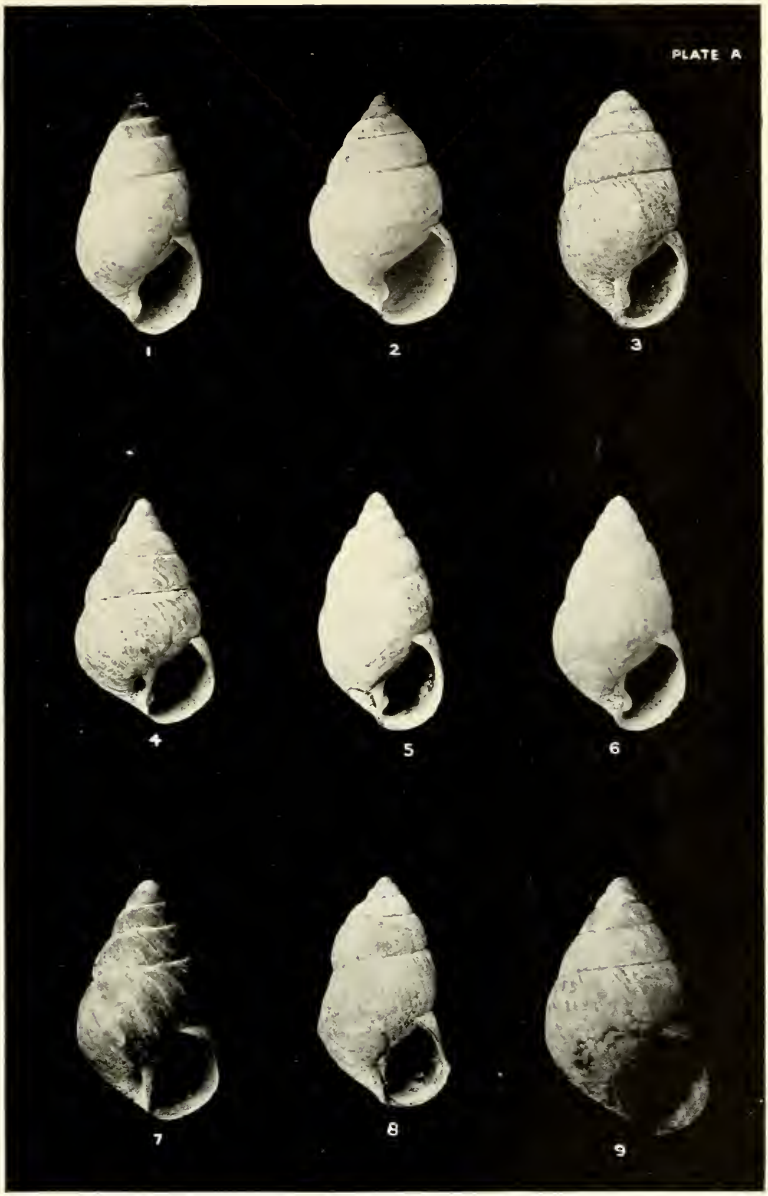
8.	" praeopima. Oahu. x 2.25	23
9.	" sericea var. anaglypta. Oahu. x 2.1	21



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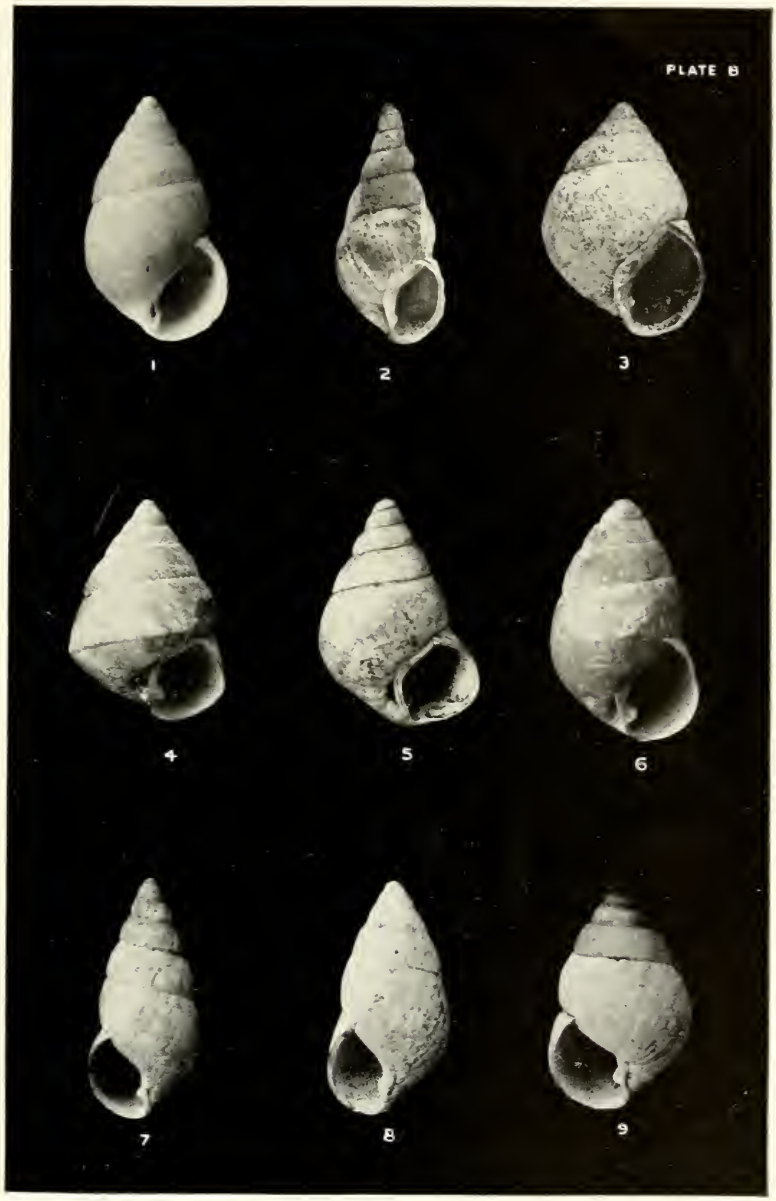

NEW SPECIES OF AMASTRA.

PLATE C

NEW SPECIES OF AMASTRA.

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OF THE

Bernice Pauahi Bishop Museum

Honolulu, Hawaii, U. S. A.

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OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF POLYNESIAN ETHNOLOGY AND NATURAL HISTORY

VOL. III — NO. 4

THE HAWAIIAN RAT

BY

WITMER STONE, A.M., Sc.D.

NOTES ON THE HAWAIIAN RAT

BY

JOHN F. G. STOKES

HONOLULU, H. I.
BISHOP MUSEUM PRESS
1917

The Hawaiian Rat.

By Witmer Stone, A.M., Sc.D.
(Curator of Birds and Mammals, Academy of Natural Sciences of Philadelphia.)

While tradition and early accounts of the islands indicate that a native rat occurred plentifully in the Hawaiian Group, the species has, through the immigration of the familiar Norway and Black Rats (*Rattus norvegicus* and *R. rattus*) and the later introduction of the mongoose, disappeared so rapidly that it was generally supposed to have become extinct. Furthermore, no specimens of the animal had been preserved so far as we are aware.

In the spring of 1913 Mr. John F. G. Stokes of the Bernice Pauahi Bishop Museum discovered on the island of Kahoolawe a number of bones and some portions of mummied rodents, a few of which were referable to the House Mouse (*Mus musculus*), but the majority to a species intermediate in size between this and the introduced rats, which he identified (correctly so it proved) as the Hawaiian Rat. His discovery of these remains is best told in his own words:

"In March and April of 1913 I was on the island of Kahoolawe investigating the site of an ancient fishing station or early fish-hook factory. It was situated on the west shore of Kamohio Gulf at about the middle of the southern coast (see U. S. Coast and Geodetic Survey Reg. Map No. 2726, immediately to the east of Black /\ ), and protected from the ocean swell by a small promontory. A few feet back from the sea was a rock shelter, worn by wave action apparently, preceding a slight elevation of the land. The cliffs enclosing the gulf were very precipitous, making access from the interior of the island to the sea almost prohibitive in that vicinity. They were barren of vegetation. The entrance and interior of the shelter were partially filled by talus which had fallen from a vertical cliff on the northern side, and on the slopes of the talus, within the shelter, loose stone terraces had been built. One use of the terraces (and perhaps the only one)

was as offertoria to the beach-worn stones which had been set up as fish-gods. The offerings had consisted mainly of fish, but vegetable material was also found, in addition to the remains of petrels. The indications from the ethnological material obtained were that the location had been abandoned early in the nineteenth century.

"The rat remains were found among the lower stones of the terraces and in the underlying talus. The spot was very dry, and the floor of the shelter and the terraces were covered by a layer of dust from six to eight inches deep. The interior of the shelter was never reached by rain, as we had an opportunity of observing during a very heavy storm. There is no reason to suppose that the specimens might not have been preserved for many generations to come.

"I believe that these rats were present during the occupation of the site by the early fishermen, and subsisted on the offerings.

"There is little doubt that we gathered all the fragments that were available when we arrived at the place, as all the dirt and fine dust was sifted. It puzzled me, however, to find mummies or adhering bones, as in Lot 5, and not to find the skull (Pl. IX). Lot 4 gave us a deal of trouble. We found the mummy of the rat head downwards with its skull crushed between two stones, apparently by a movement of the talus as it dived for its home. Beside it was a bird bone which it had possibly been carrying. The stones were carefully removed and the fine dirt below was sifted. As we found no more bones, we removed the lower stones hoping to get the remains of the crushed skull. The jaw (No. 9033) and skull (No. 9032) were found, but I did not realize until Professor W. A. Bryan pointed it out to me in Honolulu that the skull belonged to another species [*Mus musculus*], nor did I stop to make any comparisons, as we had already spent a considerable time on the specimen.

"The last use of Kahoolawe by Hawaiians, except for occasional fishing excursions, was in 1843, when a penal settlement established by the native government was abandoned. In 1863 it was leased for fifty years as a cattle ranch, and neither the island nor the cattle were benefited thereby.

"It might be mentioned that long since the abandonment by the early fishermen of the particular spot I investigated, one or more parties of bird hunters had visited the place with dogs, to

collect petrels, which were nesting in the holes among the stones of the terraces. We found the remains of about a dozen petrels, skulls, feathers and chewed bones, in the upper layer of dust. Two goats had also died in the shelter, possibly being unable to get out."

In May, 1915, Mr. Stokes found a number of mandibles and bones of the same species of rat on the sand-dunes of Heleloa, Mokapu Peninsula, Oahu (Pl. X). Most of these were obtained on the surface of wind-blown hollows on the dunes. In a sand quarry a few hundred feet distant, a broken skull and other fragments were picked up. Upon searching for traces of living rats, several small holes were observed on the tops of the dunes, among the scattered shore plants and scanty grass. As this point of land is almost insular, the possibility suggested itself that the imported rats and mongoose had not yet reached it, and that the native rat might still persist there. Eight traps were therefore set but without result, although one was sprung. An opportunity to repeat the experiment has not occurred.

On the island of Popoia, Kailua Bay, Oahu (Pl. X), a small rusty brown rat had been seen by Mr. Stokes early in 1915, and on the chance that it might be the supposed extinct species a trap was set on May 7, baited with bacon rind and a few drops of oils of aniseed and rhodium. On the 9th the trap contained two dead males and two living females. Mr. Stokes says:

"One of the males (No. 9011) showed the marks of a severe fight, and undoubtedly there had been a fight to a finish. The others were drowned, and the lot (Nos. 9010-9013) placed in alcohol immediately.

"On the 11th, No. 9016 was taken in the morning, and a male, probably her mate, in the afternoon. The trap was visited twice daily, and the location changed every time a day passed without a catch.

"Returning from Honolulu a fortnight later, the trap was set out for about seven days, and only one female caught.

"It seemed well to let them breed up a little, as the island is very small, so no more trapping was done until Sept. 18-19th, when the exposure of the trap for a night and a day secured a pair. The bait was bacon rind only. The female (No. 9017) looked seedy and died a few days afterwards.

"The live rats were kept at my home in Honolulu in the hope that they would breed. No. 9016 and her mate were in one cage, and the second female in another.

"On June 11th, the desired result not being obtained, the second female was added to the pair. She, however, would hold no converse with either of them, taking possession of their sleeping box and showing a disposition to quarrel if either approached. Her presence, though, appeared to excite the male, who finding his approaches were repulsed by the stranger, confined them to his mate.

"About June 21st, finding that No. 9016 was pregnant, she was removed to the other cage, but seemed unable to produce her young and died on the 28th.

"I thought the other female was mating about a month ago (September, 1915), but nothing has happened since. There are now on hand, alive, two males and one female.

"The cages are boxes of comparatively soft wood, with tops and sides removed, and completely covered on the outside with one-half inch mesh wire. It had surprised me that the rats never made any attempt to gnaw through the wood. For the first few days of their captivity they tried to bite through the exposed wire.

"They have taken readily to any food we have given them, and are fond of fish and grain. A crab's leg was wasted, as they seemed unable to crush the shell.

"Popoia islet is a flat piece of raised coral reef, varying in height above the sea from four to seven feet. The area is only three acres. It is just about a furlong from the main shore, the intervening depth reaching eight feet. There is little question that at one period it was joined to Oahu, as there are many places along the shore of Kailua Bay where the formation is exactly similar. The separation may have taken place through depression, but was more probably due to the wave action or dissolution of the reef rock from other causes not yet explained. The islet is rapidly being worn away at present, as may be observed from some of the enclosed prints (Pls. XI, XII).

"The surface of Popoia is broken abruptly by many hollows, approximately twenty by thirty feet in size and one to three feet deep, and is honey-combed in all directions by small vertical and horizontal holes. In every hollow examined soil of volcanic ori-

gin was present, and below the level of this soil I found in two places, where the waves have exposed it, a phosphate rock containing the tests of arboreal and terrestrial mollusca. The presence of these fossils, according to Dr. C. Montague Cooke, indicates a forest area at an earlier period, and a climate very different to that at present.

"The vegetation now consists of twenty-five species, mostly shore plants, seven of which are of foreign introduction. There is but one species of tree, the *milo* (*Thespesia populnea*) present in a small forest covering about one-fifth of the lee side of the island. The open area is partly and the depressions entirely covered with our common salt marsh weed (*Sesuvium Portulacastrum*), and there are three grasses, one of which is native. Of the plants suitable for rat food, there are the grasses, several small berries and the seeds of the milo. All the plants have been identified by Mr. C. N. Forbes, our botanist, and I will send you a list if you wish.

"Other life on Popoia is represented, among the birds, by at least two species of petrel (which nest and spend the day time in the surface holes, feeding only at night), the migratory and shore birds (plover, turnstone, snipe, etc.), and two introduced land birds which pass the night there for security. The owl or some other predatory bird must occasionally visit it, as on two occasions I have found on the open surface of the island partly eaten rats—one minus a head, and another without head and shoulders. The Hawaiian hawk has not been reported from this vicinity.

"A skink is very abundant, being found in every corner of the island. I had never seen any geckos until I began to catch the skink, when I saw four specimens and secured three, representing two species. The five skinks caught were of the same species.

"There are the usual shore and rock crabs, and once I secured in the rat trap a pair of *Geograpsus crinipes* (Dana) which I had not seen before.

"Before going farther, I should mention that I do not mean to imply that the presence of the rats on Popoia necessarily dated from the ancient forest conditions above referred to. It may have been so. They may also have been carried there since the island was separated from the shore, in the natives' canoes, a means not so readily available to the imported foreign rats and mongoose on account of their larger size. [257]

"I have been wondering what the principal food of the rats might be on Popoia. Their habits are difficult to study on account of their extreme shyness. The only knowledge I ever had of their presence was the rapid disappearance of a diminutive brown animal on several occasions, and until I saw them in the trap it would have been impossible to give any adequate description of them. A native who frequently visited Popoia told me that there were no rats there. In dry weather—the greater part of the year—I doubt if the vegetable life would support them. I am inclined to think that the rats depend largely on the food brought in by the petrels, whose burrows they seem to share. The only man whom I have met who has previously seen the Hawaiian rat alive is Mr. Augustus Knudsen of Kauai. He told me some time ago that many years previously he had observed the rats and sea birds living together on the ocean cliffs of Kauai, and that the rats did not appear to disturb the eggs, nor the birds the rats. He had not seen them for many years.

"Similar conditions undoubtedly exist on Popoia. The opportunities for observation, however, are not the same, as the tern, which is probably what Mr. Knudsen referred to, nests in open, exposed places, and the petrel the exact opposite."

So much for Mr. Stokes' interesting rediscovery of this supposed extinct mammal. The next question is to determine its identity and relationship to other forms. For this purpose the Bishop Museum has very kindly placed all of its material in my hands for study, consisting of the several lots of bones and seven rats in alcohol, three males and four females.

Two specimens were immediately removed from the alcohol and prepared as skins, the skulls being carefully cleaned.

The first description of a rat from the Pacific islands is by Titian R. Peale, naturalist of the U. S. Exploring Expedition, who in his report of the birds and mammals obtained by the expedition proposed the name *Mus exulans* for specimens of native rats obtained on the Dog and Disappointment Islands (Paumotu Archipelago), Tahiti, Wake Island (20° west of Marianas, 10° north of Marshalls) and Hull's Island (Phoenix Group).

A specimen from Tahiti, which may be regarded as the type, is still preserved in the U. S. National Museum, but lacks the skull.

Peale's description leaves much to be desired, as he merely says, "·····so like the common Brown or Norway Rat, *M. decumanus* of naturalists, that they might be pronounced a diminutive variety·····" His plate, while it differs in certain proportions and colors, and in the hair on the tail and forearms, from Mr. Stokes' specimens, is probably not a very reliable representation of the specimen from which it was drawn and should not be given too much consideration.

Peale also described, at greater length, another species *Mus vitiensis* from Fiji.

The types of *M. exulans* and *M. vitiensis* (Nos. 3730 and 3731, Colln. United States National Museum), kindly loaned me through the courtesy of Mr. G. S. Miller Jr., curator of mammals, are old dismounted specimens of an almost uniform yellowish brown color above and below. They were probably immersed in spirits before mounting, and this together with long exposure to light has practically ruined them for purposes of comparison, and they are without skulls.

The hair appears longer and more bristly than in the Hawaiian specimens, especially in the case of *M. exulans*, while the scales on the tail in *vitiensis* are larger and more conspicuous. In each of the types there appears to be more hair on the tail than in the Hawaiian animal.

Mr. Edgar R. Waite (1897)[1] has discussed the Pacific native rat and follows current opinion that specimens from the various Polynesian islands are all referable to one species, for which of course he adopts the name *Mus exulans* Peale. He had, however, no series of specimens before him, so that his interesting paper by no means settles this question. He does, nevertheless, give a good description of a specimen from Funafuti Atoll and figures the skull, which, if the figure is accurate, is broader than that of the Hawaiian animal. Waite does not mention the dark color of the under side of the feet, which is very characteristic of all Mr. Stokes' specimens, while the number of foot-pads in the two do not coincide.

In view of the unsatisfactory nature of the original descriptions of Peale's species and the lack of recent material from these other island groups, no satisfactory results can be reached as to the relationship of the native rats of the several Pacific islands. It

[1] Mammals, Reptiles and Fishes of Funafuti, Mem. Aust. Mus., III, 174, pl. viii, figs. 1*a*-1*f*.

does, however, seem extremely unlikely that islands, as far removed as Tahiti and Fiji, should have possessed animals identical with those of Hawaii. Therefore it would seem desirable to name the Hawaiian native rat as a distinct species and a description of it is here appended. It may be known as:

Rattus[1] hawaiiensis.

(Plate VIII.)

Type. No. 9010, Colln. Bernice Pauahi Bishop Museum. Popoia Island, Oahu, Hawaiian Islands, ♂. May 9, 1915.

Description. Above cinnamon brown or russet shading into cinnamon buff on the sides and light buff or buffy white below, strongly mixed with black hairs on the back and sides. Feet nearly white above, the dusky color of the legs overspreading the tarsus and carpus and narrowing to a point. Whole underside of the hind feet dark.

Measurements. Length, 239 mm.; tail, 118; hind foot, 26; ear, 9.

Skull. Length (occipito-nasal), 32 mm.; zygomatic breadth, 16; interorbital breadth, 5.5; basilar length of Hensel, 27.5; molar tooth row, 5.5; median length of nasals, 12; total length of mandible, 22.

A female (No. 9012, Colln. Bernice Pauahi Bishop Museum), now in the collection of the Academy of Natural Sciences of Philadelphia, is exactly similar in coloration but slightly smaller in size.

Measurements. Length, 225 mm.; tail, 111; hind foot, 25; ear, 9.

Skull. Length (occipito-nasal), 31 mm.; zygomatic breadth, 16; interorbital breadth, 5.3; basilar length of Hensel, 25; molar tooth row, 5.5; median length of nasals, 11; total length of mandible, 21.

In concluding the account of this interesting rodent, I wish to acknowledge the kindness of Mr. J. F. G. Stokes in placing all of his material and notes in my hands for description. The paper is really more his than mine, and to his indefatigable efforts we are indebted for bringing to light this animal long since regarded as extinct.

[1] The Hawaiian Rat is placed in the genus *Rattus* as opposed to *Mus* (type *M. musculus*), following Trouessart. It may be that the old genus *Mus* is susceptible of further generic subdivision and that this species is not congeneric with the Norway and Black Rats.

Notes on the Hawaiian Rat.

By John F. G. Stokes.

In the preceding paper Dr. Stone has undertaken to give the writer more credit for his observations than is his due, such observations being mostly the result of accidental findings in the prosecution of his regular work; and has further done him the honor of inviting him to add his name as co-author, which it seemed to him more fitting to decline, since his work is outside the field of systematic zoology.

We much appreciate Dr. Stone's kindness in looking into the subject of the native rat and describing the specimens, especially as there is no mammalogist on the Museum's staff.

The following notes may be added to those already communicated and may be of service in throwing more light on the habits of the native rat. They include observations made since the despatch of the original rat material to Dr. Stone, and references to the rat in the life of the Hawaiian people.

On the island of Kauai, in 1916, the Weliweli and Mahaulepu sand-dunes, in the neighborhood of some petroglyphs the writer was measuring, were visited. Some little time was spent on the Weliweli dunes gathering fossil land shells, and incidentally a fairly thorough but unsuccessful search for rat bones was made. On the Mahaulepu dunes, three miles to the north, the visit was briefer and the search confined to ethnological material and fossil shells, since the Weliweli dunes had yielded no rat remains. A few samples of sand containing the fossil shells from Mahaulepu were brought back to Honolulu, and when Dr. C. M. Cooke sifted the same, he found a small mammal bone comparable in size to the rat bones from Heleloa and Kahoolawe. Being a mammal bone, its size would indicate that it probably belonged to the native rat species.

The same year remains of rats were found at three places in the Wailuku sand-dunes, Maui. These dunes, used as pastures, extend about five miles to the northeast and southwest of the Iao stream's stony bed. The stream, a mountain torrent subject to heavy floods, has swung back and forth, during its existence, over

a breadth of a quarter of a mile. The resultant stretch of volcanic rocks and soil divides the two series of dunes. The present trend of Iao is westward, and it is now undermining the dunes on that side, leaving a high bank of dry, rolling sand. The eastern series of dunes is now well covered with fodder trees (*Prosopis juliflora*), but on the dry, western series the vegetation is merely a thin growth of dune grasses and weeds; its upper strata are changing into æolian sandstone.

Crowning two of the high dunes of the latter series, and about three hundred feet apart are the foundations of the old temples Pihana and Halekii. The foundations are loose, dry-laid, water-worn stones, piled up over a century ago by the Hawaiians. Such stones are seldom seen on the dunes, and when found there, their presence is traceable to human agency. Generally near them are stunted lantana shrubs. The Pihana and Halekii dunes are more or less isolated from the surrounding volcanic soil and rocks by other sand-hills or bare sandy slopes; Halekii more so than Pihana.

The rat specimens first noted here were a few scattered leg bones among the remains of the offerings—human, pig, dog and fish bones, shells, etc., on the surface at Pihana. Offerings at temples ceased a century ago, and the large mammal bones were almost completely destroyed by weathering. The rat bones were in a good state of preservation, and unless they had been recently uncovered by the sand shifting, they post-dated the other bones. They were from mature animals, and probably the native rat. Half of Pihana's foundations had slid down the steep bank which the stream had undermined, and the offerings were found on the remaining portion of the stone floor and on the sliding sand.

Halekii temple had not been disturbed by the stream and was five hundred feet distant from it. A recently dead rat was found there exposed to the weather on one of the foundation stones. It had been dead probably less than ten days, as the eyes were present in position. Decomposition of the soft body parts was complete, and the flesh of the legs and tail had dried. There was still a marked odor. The fur was present, except on the right side, on which the animal was lying. The writer has little hesitation in identifying the specimen as a native rat, from the color of the fur and the size of the animal.

This specimen and the rat bones above mentioned were forwarded to Dr. Stone, but crossed his MS. in the mails.

In the eastern dune series, on the site of the old battle field of Kakanilua, two miles from Halekii, half a mandible and two leg bones of what may reasonably be referred to the native rat, were later picked from the surface of the sand.

The presence of the living rats on Popoia (reported to Dr. Stone) suggested a search on other islets. There is a small mushroom-shaped islet called Kekepa on the coral reef at the eastern entrance to Kaneohe Bay (see map, Plate X). Its area is about an acre, and the highest point of its surface is fifteen to eighteen feet above mean tide. On account of its situation a landing can only be made on the narrow wave-washed shelf encircling its base, at low tide and in calm weather. The writer visited Kekepa in 1915. It was of raised coral reef formation; its surface was honeycombed, and the same species of petrels were nesting as at Popoia. Vegetation was confined to shore plants; there were no shrubs or trees. Though the writer, when starting, prepared himself with traps, he could not use them since the boatman, on reaching Kekepa, limited the stay to fifteen minutes on account of the rising sea. Enough was seen of conditions at Kekepa, however, to suggest the probability of the rat being present.

Another reason for the visit was curiosity aroused by the account of a young native boy that his parents had seen on the islet a small brown bird of the size of the imported mina (*Acridotheres tristis*) which jumped instead of flying. The parents were absent, and the information above was furnished in reply to a casual enquiry of what was to be seen on Kekepa, which was in sight in the distance. Of course, the description of the bird would fit one of the extinct Hawaiian rails (*Pennula* sp.) better than any other known Hawaiian birds, and considering the honey-combed condition of the surface of Kekepa, the writer would not care to state that the rail was not on the islet.

On the volcanic island of Mokulua North a fairly thorough search was made among the rocks near the sea, and in likely places a little further back, without finding indications of rats. A less thorough search at Mokulua South gave no better results. These islands are high and were probably formed independently from Oahu.

Summarizing the results concerning native species from all the localities visited and mentioned in this and Dr. Stone's article preceding, we get, if the writer's identification of the material be correct, on the islands of—

Kauai:	
Sand-dunes, Weliweli.	No traces of rats.
Sand-dunes, Mahaulepu.	Skeletal material.
Oahu:	
Reef islet of Popoia.	Living rats.
Reef islet of Kekepa.	Natural conditions for rats similar to Popoia.
Volcanic coastal islets of Mokulua.	No traces of rats.
Sand-dunes, Heleloa.	Skeletal material and possibly living rats.
Maui:	
Sand-dunes, Wailuku.	Skeletal and fresh material.
Kahoolawe:	
On barren coast.	Skeletal material, with introduced species.

Except for Kahoolawe, these observations cover a period of less than two years. Only at Popoia and Kahoolawe was there any amount of time spent. When we consider that the results obtained were mostly due to accidental discoveries through brief visits made only as time permitted, the conclusion seems obvious that the Hawaiian rat may yet be found alive in many other localities which it may have reached, where conditions are favorable for its preservation.

In seeking for these favorable conditions, we would ordinarily select localities from which the native rodent's introduced competitors or natural enemies (large rats and mongoose) are debarred by natural conditions; which do not furnish sufficient food or cover to attract them; or to which they have not so far extended. This much has apparently been found in the shore-lying islets and coastal sand-dunes, which are common in this group. Among the former, for instance, on Oahu (see map) may be Kekepa (raised reef) and Mokolii (volcanic). Other islands, Kapapa (raised reef) and Mokumanu, Mokulua, and Manana (all volcanic) may be too distant. Moku o Loe (volcanic), in Kaneohe Bay, should be a good locality, and it is reported as being overrun with rats of a species not known at present. This island was recently inhabited, and is so frequently and easily visited that the rat may well prove to be of an introduced species.

The sand-dunes, used for cattle grazing, are generally covered with a sparse herbal growth, sufficient perhaps to support the

smaller native rat, yet not enough to attract the larger introduced animals from the richer pastures around the human dwellings or in the sugar-cane fields inland. On the dunes the mongoose is a rare visitor. Its nature is to stay close to cover, and a place bare of stones and without thick grass probably would not appeal as good hunting ground.

The writer would suggest that a study of conditions similar to those of the Hawaiian group, in the islands of the South and West Pacific, might demonstrate that the other species of Oceanian rats, now believed to be rare or extinct, are yet to be found alive.[1] It is a matter for zoologists to follow up if the suggestion be deemed worthy of consideration.

Some of the Popoian rats were kept alive in Honolulu, as reported to Dr. Stone. The intention was to breed them and distribute the progeny among some of the more distant small islets where they could work no harm and might be preserved from their introduced enemies. The record is herewith :—

FIRST CAGE.

May 11, 1915.	No. 0 ♂ and No. 9016 ♀ trapped, placed together.
June 11, 1915.	No. 9040 ♀ added to pair. No. 0 ♂ and No. 9016 ♀ mated.
June 28, 1915.	No. 9016 ♀ died in parturition.
June 28, 1916.	No. 9040 ♀ died.
At date.	No. 0 ♂ on hand, alive.

SECOND CAGE.

Sept. 19, 1915.	No. 9024 ♂ and No. 9017 ♀ trapped, placed together.
Sept. 22, 1915.	No. 9017 ♀ died.
Nov. 29, 1915.	No. 9024 ♂ died.

Observations on the habits of the rats have been conducted with difficulty on account of the extreme shyness of the animals. The cages were fastened just outside window sills so that the ani-

[1] Skeletal material might be found in old Polynesian temples. In the notes sent to Dr. Stone it was mentioned that the fishermen's religious offerings of food (fish, meat, fruit and vegetables) had served to sustain the Kahoolawe rats. The specimens found on the Wailuku ruins were, probably, all comparatively recent, but their presence calls to mind the indirect reference made by many writers, native and others, to rats in Hawaiian temples. There the rodents would find ample shelter among the loose stones, and live on the fat of the land. The food offerings were abundant and varied. "Poor as a church mouse" could not be said of the Hawaiian temple rat. In Tahiti particularly, where worship and offerings were very similar to the Hawaiian, a search might bring results which would aid materially in identifying Peale's *Mus exulans*.

mals could be watched from the room through the uncovered wire at the top. Their reaction to sound and scent was so sharp that they could detect the quiet approach of an observer before they could see him and would then remain motionless, except for their twitching snouts and ears, as long as a person cared to watch from a little distance. A nearer approach to the window would cause a scurry for the sleeping box. Subsequent observations would then be limited to the pair of twitching noses poking out of the box opening.

The appearance of a person above the cage always terrified them. Later, the cage was changed to a window where the rats were just above the level of one's head when standing on the ground. In this situation, one of the rats became tame enough to eat from (and of) the fingers. However, movement above the cage continued to frighten them as much as ever, and the upper part of the cage was subsequently covered over.

Noise of any kind disturbed them, particularly the sharp snapping of the cage wire when opening the little door, when they would freeze as though expecting to meet their doom. It is evident that any future observations should be conducted in a cage which can be handled noiselessly.

They are on the move during the whole day, and feed freely at this time. Judging from the noise, however, their greatest activity is in the early part of the night. Their long sleep must take place between 9 P.M and 8 A.M.

Their food has been bread, cooked meat, bones, fresh, salt and smoked fish, lettuce, sow-thistle, cabbage, wheat, oats, walnuts, apples or anything else in the house. The bones are not closely gnawed. Papaya (*Carica papaia*), a fruit of which the imported rats are very fond, destroying many on the trees, was refused by those under observation.[1] A leg of the common rock crab (*Grapsus* sp.) was also refused, though probably on account of the difficulty of breaking through the shell. They have been observed chasing the common wood-roach, which occasionally crawls into the cage, but the chase stopped as soon as the observer approached the cage from above and the roach escaped. Living sow-bugs and

[1] In January, 1917, papaya was fed to and eaten by the male which had been in captivity for twenty months. At this time also the milo seeds were first fed, to the same rat; they were not eaten very readily.

parts of centipedes were eaten readily, the harder portions being chewed for some time and then ejected. An immature mouse was once found in the cage with the head eaten.

Early in 1916, during the damp weather, the introduced snail (*Eulota similaris*) was very plentiful. A few were fed by the writer's wife to the rats in the illustration (Pls. XIII, XIV); they ate them very readily, biting through and completely crushing the fragile shells with ease. The rodents sat on their haunches and held the snails with their fore paws. In less than an hour twenty-one snails were eaten, and the indications were that more would have been consumed had they been available. From this time on snails, when found, became a part of the rats' diet. One of the large introduced slugs (*Veronicella* sp.) was placed in the cage and the male rat made many attempts to bite it before it crawled out again.

The native arboreal and terrestrial mollusca in some of the local forests are suffering from the depredations of rats, according to present day collectors, undoubtedly the introduced species. Dr. Cooke states that, at times, scores of mutilated shells are found about the entrances to the burrows, the owners of which had apparently carried them there to eat at their leisure. On learning of the Hawaiian rats' appetite for the *Eulota*, two nearly mature living specimens of *Partulina redfieldii*, a native arboreal pulmonate, were placed in the rats' cage. The rodents attacked them only at the aperture, breaking off the outer lip and failing to reach the soft parts.

In Pl. XV, No. 2 is one of the shells so treated, placed for comparison beside a whole specimen (No. 1) of *Partulina redfieldii* of about the same size and in the same relative position. They are illustrated at the suggestion of Dr. Cooke, who has kindly mounted with them eight other specimens (Nos. 3–10) recently collected, from which the softer parts had been extracted by an introduced rat. No. 8 is harder than No. 2, and Nos. 5–7 nearly as hard.

It will be noticed that the attack by the introduced rat was generally directed at the last whorl, in which the larger part of the molluscan body lay. Of the nine specimens in the Museum's possession,[1] one, not illustrated, was also attacked at the aperture

[1] From the shell collection of Mr. Irwin Spalding.

lip. In one (No. 3) it will be observed the apex is gone. Popoian rats had always completely crushed the shells of the *Eulota*, so observations were made on the method of initial attack on this species by the remaining living native rat, ♂ No. 0. After feeding one snail at a time and then interrupting the meal, it was found on examining the shells that all were attacked at the last whorl, one of which was also broken at the aperture. In the latter instance, the body of the snail was expanded just before it was seized by the rat. From the above observations and illustrations, it might appear that the rats attack the portion of the shell where the molluscan body is found.

Many of the Hawaiian terrestrial mollusca are smaller and are provided with more fragile shells than those illustrated above, and may well have contributed to the diet of the native rat before it was displaced by the introduced species.

In the communications to Dr. Stone, reference was made to the inability or lack of desire on the part of the Popoian rats to escape by gnawing through the soft wooden lining of the cage. Evidence of the ability of the common house rats, or even mice, to gnaw through thick wood has been presented to most people who live in wooden houses. The Popoian rats, on the other hand, have made no attempt to gnaw their way out through the wood, though for the first two days of captivity they tried to bite through the exposed wire front. Bones and tough cartilage they do not seem to make an impression on, and they were unable to bite through the leg of our common rock crab, as already mentioned.

It would thus seem that there was a comparative weakness in the Hawaiian rat's gnawing system, due probably to undevelopment in the species. Such a probability could be explained if we were to take into consideration, for example, the conditions under which the house varieties of the different species operated. Foreign rats and mice have had, for very many of their generations, closely fitting wooden walls and floors to contend with, and innumerable enemies to compel them to keep close within the shelter of such wooden constructions. The Hawaiian rat shared the open life of its human neighbor, with few natural enemies except the same neighbor, and found the grass house walls, and loose stone foundations and floors, places for easy hiding.

When repacking the first rats caught on Popoia to mail to Philadelphia, a number of lice and mites were found in the original alcohol. Mr. O. H. Swezey examined them, and as our literature on the subject is very scanty, he has only tentatively determined the louse as *Polyplax* [*Haematopinus*] *spinulosa:* adults, young and eggs. Mr. J. C. Bridwell has recognized the mite as belonging to the *Gamasidæ*, and closely resembling but not identical with the poultry tick, *Dermanyssus gallinæ*.

Mr. T. G. Thrum, a lifetime student of Hawaiian legendary lore, has found in his readings many references to the native rat. In particular, an interesting account of the pastime of rat hunting is given in the legend of Pikoiakaalala,[1] the infant prodigy with the bow and arrow. The legend, full of the marvelous, is appropriately referred to at this time on account of the mention of three kinds of places where the rat-killing contests occurred. One was a wilderness or deserted cultivation field on Kauai. The second, on the coastal plains of Oahu, covered with a lowland herbaceous form of the *aweowco* (*Chenopodium sandwicheum*), among the stems and leaves of which the rats took shelter. The third was the king's grass dwelling house near the shore, where the rats were shot on the floor and the interior of the roof.

From the legend is also ascertained the mode of procedure in the contests. The first competitor shot continuously at such rats as were pointed out by his opponent to the number agreed upon. Then the latter took his turn and shot as ordered by the first. The total score, of course, determined the winner. From the same legend, it would appear that the chiefs had in their retinue, men or women employed as rat killers, and indulged in betting on the contestants' skill.

There is another account, that a place was cleared of brush and weeds, and the rats then driven into the clearing as marks for

[1] S. M. Kaui, He Kaao no Pikoiakaalala. Nupepa Kuokoa, Honolulu, Dek. 16, 1865–Mar. 18, 1866. This is not the best version, as Kaui missed the point of the legend, i. e., the opportunity of bringing in a play on words, where the youngster displayed his smartness. It was selected for this reference, however, because the places where the shooting was said to have occurred must have appeared so natural to a Hawaiian recounting the legend fifty years ago as to mislead him in his understanding of the intent of the tale. A better version, from among the Abraham Fornander MSS., will be published in the Museum Memoirs in the near future.

the archers. In the pastime the small extinct rail previously mentioned was sometimes substituted for the rat.

We have no record in the Hawaiian Group of any contrivance in the shape of a rat-trap such as occurs on some of the other Pacific islands. The bow and arrow was probably depended on to keep down the rats as vermin. As late as 1888, Mr. J. S. Emerson secured from a native, about ninety years of age, on the island of Hawaii, a small bow and arrow which was kept in the house for shooting "mice".[1] Mr. Emerson set up a mark about sixteen feet off, to test the old man's skill, and found him very proficient. The bow was not used in warfare.

The Hawaiians formerly had an outdoor rack for protecting food from dogs, hogs and rats. Sometimes it was a branched tree set up outside the house, from the branches of which the food bowls would be suspended in netted bags. In this museum are two carved wooden racks for the same purpose. They are canoe-shaped, notched on the upper edges, and were set across the ends of upright posts.[2]

One of the native superstitions concerning the rodent was that if the baby's umbilical cord (some authorities state, the boy's prepuce also) were eaten by a rat the child would grow up a liar and a thief.

[1] Introduced, without doubt. One or two references to the probable existence of a native mouse, as well as a rat, have been met with, but on what grounds it was not stated. Cook and King (Cook's Third Voyage, London, 1785, Vol. II, p. 228, and Vol. III, p. 117 respectively) both state that there were only three mammals in the Hawaiian Islands, the dog, hog and rat, resembling those seen at every other island touched at. King spent several weeks ashore and had full opportunity for observing the mouse were it present. The Hawaiian term for the rat was *iole*, and the same term in its varying dialectic forms was found among other Polynesians with the identical application. The early Hawaiian biological nomenclature was very profuse and apparently exact as to variety. To quote two examples only, there were over sixty terms for varieties of taro; and three or four terms for the fish *ulua* in its different stages of growth, although all stages were recognized as belonging to the same fish. There is little question that had there been two native rodents the ancient Hawaiians would have used two different terms. As the old systems became obsolete through foreign influence, the Hawaiians seemed to lose their aptitude in "giving a thing a name." The introduced mouse was known as *iole liilii*, "little rat", and the wharf rat *iole nui*, "big rat", which term was also applied to the rabbit.

[2] B. P. B. Museum Memoirs, vol. ii, fig. 67, p. 205.

LATER NOTES.

Dr. Stone has identified the Wailuku temple rats as the same as the others.

On February 4, 1917, I met a native at Kailua who said that his grandfather claimed to have accidentally introduced the rats to Popoia, where, according to the statement, there were none before. The account is that the rats were transported from Kailua beach in the folds of a fish-net, and escaped when the net was spread out on Popoia. The claim that such an introduction took place is reasonable, and I am glad to be able to mention it in these notes. It would suggest the advisability of examining the sand-dunes before the shore islets when looking for the native rat. The introduction occurred "more than twenty years ago," which might mean, on account of the Hawaiians' difficulty in recalling dates, any time previous to such limit. At the present time introduced rats and mice are plentiful about the houses at Kailua beach.

Two Hawaiian rats were seen on Popoia on February 4, one in the open, and one among the milo trees; and on February 11 a young male was trapped at the latter place. It was active and seemed healthy, but died on March 1.

On February 25 and March 4, Dr. C. Montague Cooke found many native rat bones on undulating sand-plains and low dunes near the northern point of Oahu. They were in beds of fossil shells, which had been disturbed by road grading. The shell deposits are probably much older than the Heleloa dunes.

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PLATES

EXPLANATION OF PLATES.

PLATE VIII.

Rattus hawaiiensis, type.

PLATE IX.

Material from Kahoolawe; No. 9032, Mus musculus. Other rat material, Rattus hawaiiensis. Nos. 9027 and 9029 from young specimens.

PLATE X.

Part of Oahu, showing location of Heleloa and Popoia.

PLATE XI.

Popoia Islet.
South shore, showing erosion.

PLATE XII.

Popoia Islet.
Upper figure. Shore pool showing erosion: looking outward.
Lower figure. Surface of northern part.

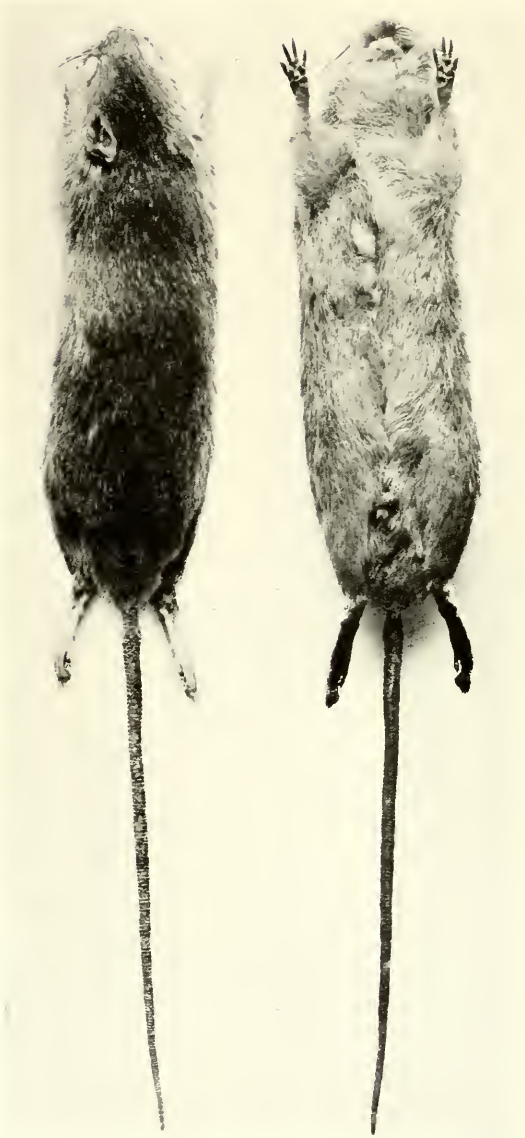
PLATES XIII, XIV.

Rattus hawaiiensis, ♂ No. 0, ♀ No. 9040. Height of drinking cup is 68 mm.

PLATE XV.

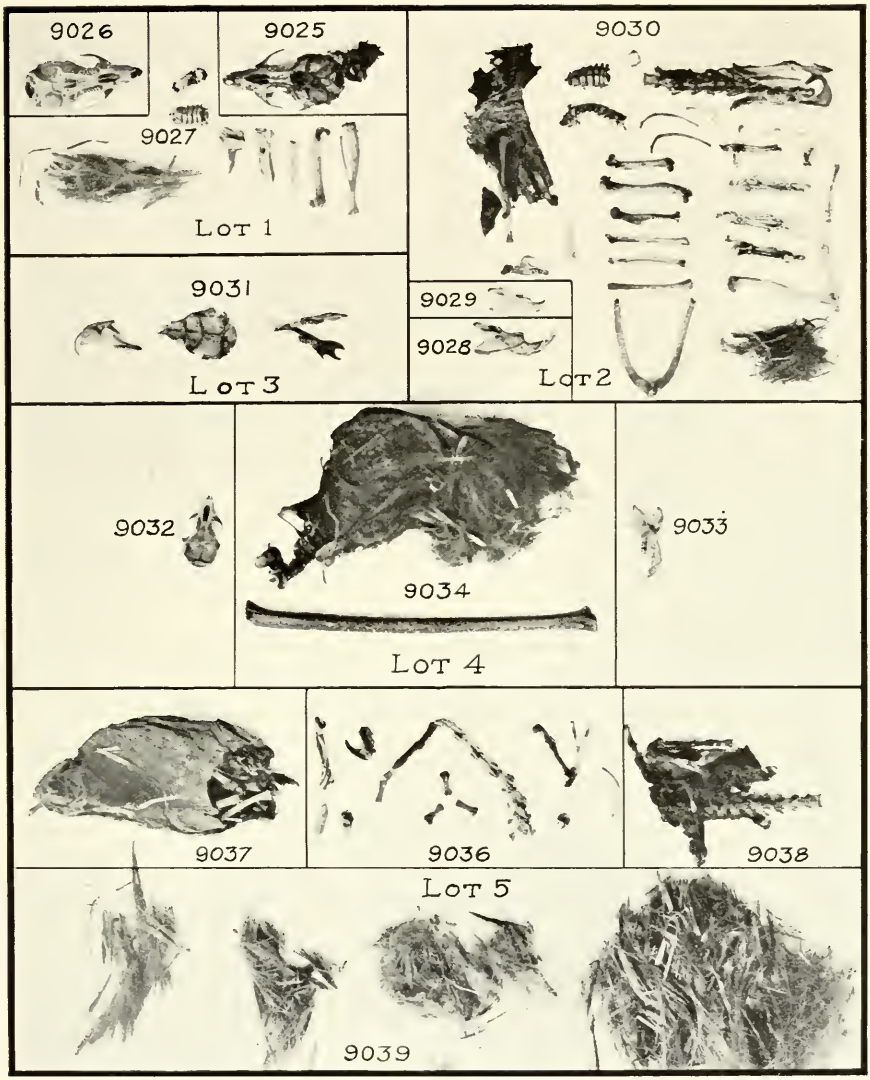
Hawaiian pulmonates attacked by rats. Explanation on plate.

× 2.5

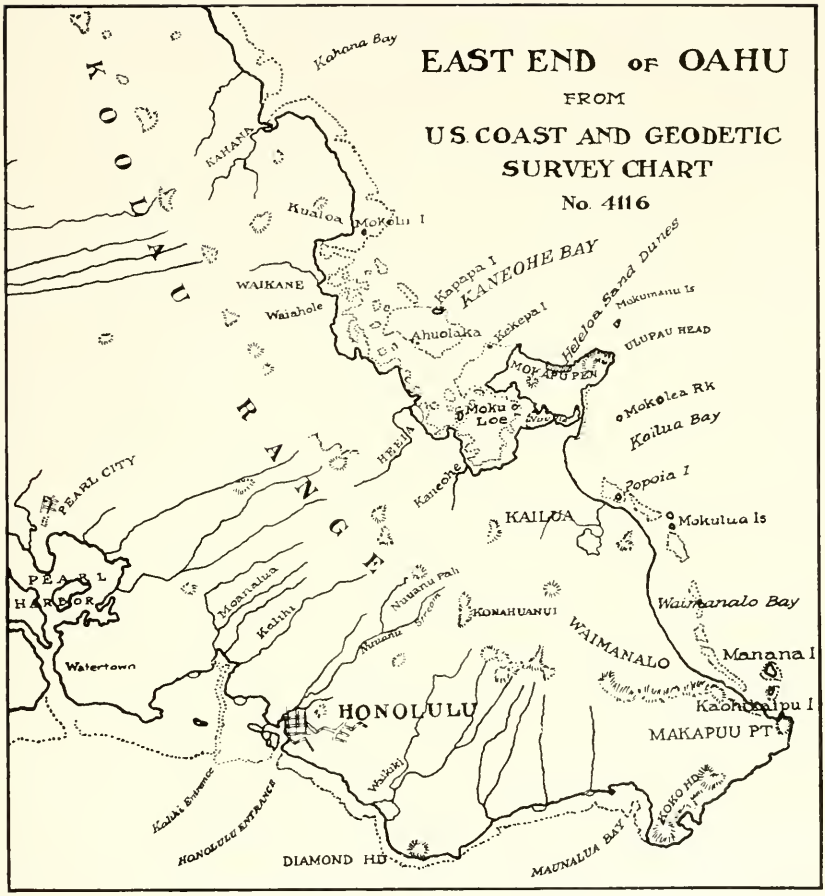


× .6

RATTUS HAWAIIENSIS, TYPE.



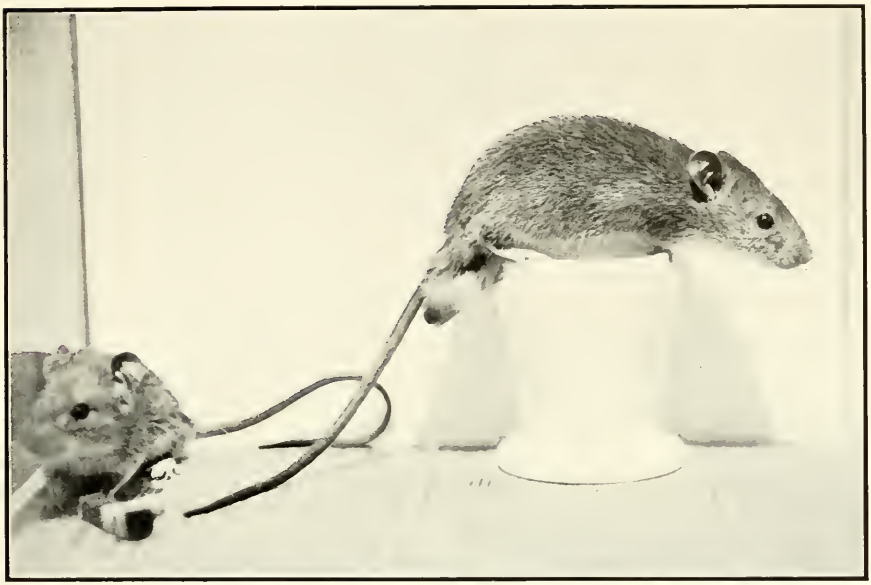
RAT AND OTHER MATERIAL FROM KAHOOLAWE.



EAST END OF OAHU.

POPOIA ISLET.

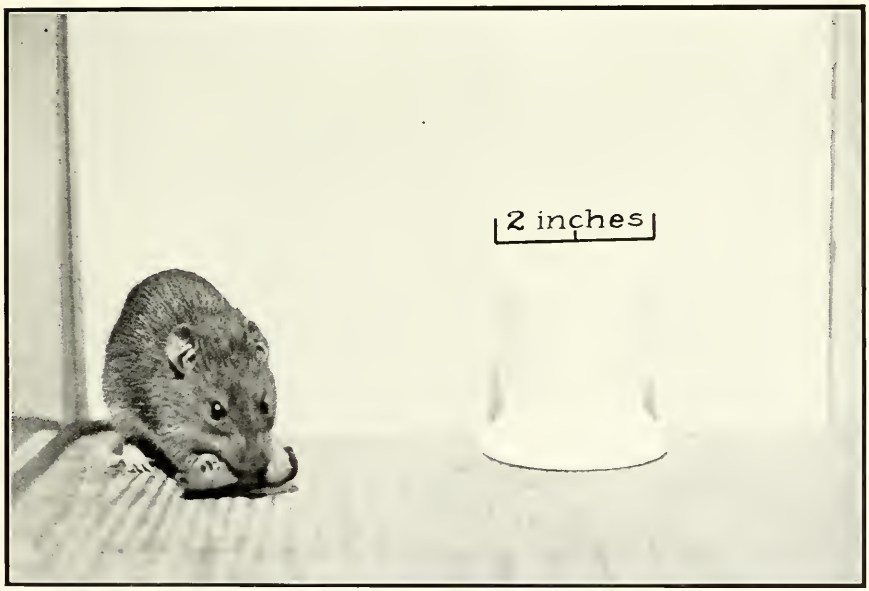
POPOIA ISLET.



♀ ♂

♂ HAWAIIAN RATS. ♀

♂ ♀



♂

HAWAIIAN RATS.

1 2 3 4 5

6 7 8 9 10

HAWAIIAN PULMONATES ATTACKED BY RATS. NO. 2 BY NATIVE RAT IN CAPTIVITY; NOS. 3–10 BY INTRODUCED RATS.

No. 1. Partulina redfieldii; whole immature specimen for comparison.
No. 2. Partulina redfieldii; aperture attacked.
No. 3. Achatinella fulgens; apex attacked.
No. 4. " fulgens; ultimate and penultimate whorls attacked.
No. 5. " phæozona; ultimate and penultimate whorls attacked.
No. 6. " apicata, var. aloha; ultimate and penultimate whorls attacked.
No. 7. Achatinella apicata, var. beata; ultimate and penultimate whorls attacked.
No. 8. Laminella gravida, var. aurantium; ultimate whorl attacked.
No. 9. Amastra spirozona; all but apical whorls attacked.
No. 10. Amastra tristis; all but apical whorls attacked.
All arboreal except No. 10, which is terrestrial.

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